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Report on Growth of Electronics in Shaanxi Province

40080095a Beijing DIANZI SHICHANG [ELECTRONICS MARKET] in Chinese
24 Nov 88 p 1

[Article by Yang Zhonglian [2799 6988 3425]: "Shaanxi Province Strengthens the Electronics Industry in All Directions"]

[Text] In the nearly 3 years since the Bureau of the Electronics Industry in Shaanxi Province began carrying out its Seventh 5-Year Plan, efforts to strengthen industrial management have achieved clear results for electronics enterprises and public agencies affiliated with the province, for electronics enterprises and public agencies affiliated with ministries, for electronics enterprises and public agencies transferred from ministry control, and for the electronics plants and institutes in other industrial sectors.

In addition to performing its function as the department within the provincial government responsible for the electronics industry, the Shaanxi Bureau of Electronics is coordinating the entire industry through its Office of the Provincial Electronics Promotion Leading Group of that bureau and the Shaanxi Province Electronics Society. It has taken the following actions in the area of industry management.

It has unified developmental planning. In a timely manner, the Electronics Bureau gathered experts, professors, and the leaders of chief electronics enterprises and public agencies from both within the outside the electronics industrial sector to discuss the strategies and planning for the development of the electronics industry in this province. They determined that during the Seventh 5-Year Plan, we would continue to pay close attention to the production of such commercial electronics products as television sets and refrigerators, and especially efforts to make such manufacture Chinese; that we would build economies of scale; that we would improve our overall competitive capacity through the establishment of enterprise groups; and, by means of all this, that we would stimulate the growth of our electronics capabilities and materials for basic electronic components. At the same time, we would adjust our commodity structures, develop such investment products as microcomputer, communications, and applied electronics

products, and lay a good technology foundation for the further rationalization of commodity structures during the Eighth 5-Year Plan. The substance of these plans is currently undergoing implementation.

It has adjusted regional distribution of electronics industries. We settled arrangements for the transfer of some factories in areas such as Shangluo and Baoji, and concentrated efforts at building electronics industrial area in the three cities of Xi'an, Xianyang, and Baoji that lie along the route of the Longhai Railroad. The work of transferring these factories is now more than one-half complete. In the Xi'an electronics industrial area, the first phase of the project that concentrates on developing semiconductor devices is mostly complete, and some major factories can go into production next year; the second phase, which focuses on developing semiconductor materials, has entered its middle stages, and work has begun on the third phase, which seeks to develop thick and thin films, delay lines, and general-purpose devices.

It has well coordinated the major scientific research and development projects. This has been especially true for the areas of microcomputer applications, mobile communications, optical communications, satellite communications, and microwave communications, where together with other relevant departments in the province it has cleared the way for connections between scientific research forces and production forces. This will allow the achievements of scientific research and development to be transformed into productive forces as quickly as possible. For example, the first unattended duplex mobile communications equipment, developed by Xidian University [the Xi'an University of Electronic Science and Technology, formerly Northwest Institute of Telecommunications Engineering], has been turned over to the Baoji Fenghuo Radio Plant for manufacture; long-term cooperative agreement has been signed. Taking advantage of the Sino-Japanese joint-venture Xigu [6007 3114] Company, which can produce 20,000 km of optical fiber and 2,400 km of optical cable annually, this company is coordinating the various strengths to jointly develop and manufacture entire sets of equipment for optical communications.

Through enhanced management, the electronics industry in Shaanxi Province has grown quickly, and the 1987 gross output value rose 35.66 percent over that of the previous year. During the first three quarters of this year, the industry has reached a gross output value of nearly 1.9 billion yuan, with income from sales of 1.528 billion yuan, and a total profits tax of 240 million yuan, which represent growths of about 50 percent over those of the same period last year.

New Provisions Announced for New-Product Development

40080095b Beijing DIANZI SHICHANG [ELECTRONICS MARKET] in Chinese
1 Dec 88 p 1

[Article by Wen Jian [5113 1696]: "The State Has New Provisions for New-Product Development by Enterprises"]

[Text] To further stimulate the integration of scientific and technical development with economic construction, China's tax bureau and commodity pricing departments are currently joining together to formulate beneficial policies that will sustain technological development.

Tax revenue preferences for new products will be changed from a uniform exemption from taxation to either tax reduction or exemption. There will be distinctions in time limits for new-product tax reductions: those at the national level will be changed to 3 years or less, and those at the local level will be changed to 2 years or less; primary support will be given to the research and development of high- and new-technology products.

Tax reduction or exemption will be given to new products in trial production, their time limits to be calculated from the day of first sales.

Greater tax-revenue advantages will be provided to aid the optimization of the varieties and structures of social products, and to expand the generation of foreign exchange through exports, as well as new products for the growth of export-oriented economies.

Beginning in 1989, there will be management through a method that integrates adoption of conditions for sustaining tax reductions or exemptions for those policies in relation to new products with "quota control"; that is, a quota will be determined for the number of new products throughout the country for which taxes can be reduced or exempted, and the volume of reductions or exemptions for these new products will also be determined at that time.

An official of the Commodity Price Investigation Department of the State Administration of Commodity Prices gave the opinion that for the most part new products should undergo a period of test-market pricing, after which the official prices would be determined. Apart from those major new products for which the state has other provisions, the authority for formulating test marketing prices for new products will in principle remain with the testing enterprise. The effective period of test-market pricing will consist of two categories: 1-2 years for civilian new products, 2 years for national major new products, 1-3 years for new products of production materials, and 3 years for national major new products. For special major new products on a national level for which there is a greater degree of difficulty and for which the trial production period is longer, by application to departments of the State Council concerned with business, in consideration of overall equanimity of the State Planning Commission, and with the approval of the State Administration of Commodity Prices, an appropriate delay can be afforded the trial period. After the test marketing periods for new products, and in accordance with relevant provisions and regulations, the official prices will be reported to commodity pricing departments.

Oceanography Institute Joins in Economic Activity

40080095c Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET NEWS] in Chinese 10 Dec 88 p 1

[Article by Liu Guanquan [0491 7070 2938]: "Chinese Academy of Sciences' Oceanography Institute Creates New Mechanisms for Science and Technology Operations"]

[Text] During the restructuring of the science and technology system, the Chinese Academy of Science (CAS) Oceanography Institute continuously adjusted its internal structure, forming new operational mechanisms. At the same time as it was actively taking on heavy tasking from the state and their area, it established five new operational mechanisms for scientific research; this act clears new ground for scientists and technicians to involve themselves in economic construction.

This institute is structured as a multi-discipline, comprehensive oceanography institute, and in accordance with their own characteristics they have created five forms of economic entities. They are: the economic entity for technology development, that for export-oriented science and technology, an S&T economic entity that consists of the entire process from scientific research to production to operations, an S&T economic entity that is technology share-holding, and a mid-point testing base that unifies experimentation, demonstration and production.

The technology company that this institute has created relies upon abundant scientific and technical advantages, and is a technology-development economic entity that undertakes the dissemination of technological achievements, the transfer of rights to technology, consulting services, and the development of new products. Since its inception 3 years ago, it has signed contracts with 225 units throughout the country for a volume of transactions reaching more than 5.9 million yuan, and it provided more than 200 sales of technology achievements and instances of consulting services for some 150 units in China.

In 1984, this institute began a joint venture with the American ORE Company, establishing the China ORE Company, a model for the export-oriented science and technology economic entities of this institute. In the bidding for the surveys of the first phase of the China oceanographic oil-development project as contracted by the U.K.'s Cluff Petroleum company, this company several times defeated competitors within China. Their high-technology scientific products have also began to enter world markets, and the Huaning Marine Engineering Company set up by this institute in Shenzhen has already earned net profits of US$60,000. Since the end of last year [1987], the CAS Oceanography Institute has joined with Zhonghan township in Laoshan County to build the Zhonghan Ocean Pearl Cultivation Beds, and with 1.1 million yuan in bank loans build the Shilaoren Shrimp Cultivation Field, joined with Xujiamai Island to build the Xujiamai Island Shellfish Cultivation Technology Development Center, and joined with the Chinese Academy of Sciences to build the Qingdao Marine Cultivation Technology Development Company. These four S&T economic entities that combine research, production, and operations transform the research achievements form the institute into productive forces, which plays a catalytic role for township enterprises that rely upon S&T invigoration.

The institute is also operating economic entities together with local enterprises in a shareholding mode. The shrimp bait formula of this institute was a project of CAS, which jointly formed the Bait Processing Plant with the Shandong [Province] Shouguang Export Cold Storage Plant to quickly use this technology in production. Recently, the institute also used the technology shareholding mode to jointly form the Weihai Marine Algae Industry Company together with the Weihai City Huancui district Gangshan Aquatic Products Company, the Shandong Province Food Products Import/Export Company, and the Weihai City Food Product Import/Export Company.

The Huangdao Increased Cultivation Experimental Station was built in 1981, and is a mid-point experimental site for experiments with the artificial and increased cultivation of fish, shrimp, and shellfish, with which it combines its functions as a demonstration site and for production. This year, this experimental station took in 230,000 yuan with just one project involving bay scallops, and the value of the products they raised was 170,000 yuan.

At present, there are more than 100 people involved in these five types of economic entities of the CAS Oceanography Institute. This is 12 percent of all employees of the institute, and temporary service personnel comprise 20 percent of all people in the institute, all of which has created a remarkable industrial contingent.

Hubei Province's "Embryo" Strategy for "Spark Plan"

40080095d Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET NEWS] in Chinese 10 Dec 88 p 1

[Article by Zhang Tao [1728 3447] and Zhang Zhiqing [1728 1807 3237]: "Xuanchang City Implants S&T 'Embryo' As Township Enterprises Seek New Opportunities"]

[Text] The city of Xuanchang in Hubei Province is providing fresh new experience with their answers to questions on how to adopt complementary measures during implementation of the "Spark Plan" and how to ignite the "Spark" that sets things ablaze, as they have been implanting science and technology "embryos" and "genes" of modern civilization into township enterprises and the rural economy.

Over the last three years, Xuanchang City has been involved with 79 "Spark Plan" projects, among which 6 were at a national level and 23 were at the provincial level, and for which total funding was 29.219 million yuan. According to statistics from the 64 projects that have officially gone into operation, an output value of 70.2191 million yuan has been generated, with total accumulation of 11.7482 million yuan.

As it has implemented the national "Spark Plan," this city has established a "Spark Plan" leading group, at the head of which is the science and technology commission. It has determined the "5, 10, 100, and 1,000" overall goals: the establishment of five farm-produce and side-line produce bases, a focus on ten township enterprise demonstration sites with special features, one hundred technology development projects, and the training of 5,000 technicians. It has simultaneously adopted seven measures: the working out of bi-directional input-output goals; leading research and development organizations into participation in "Spark Plan" measures; using the technology marketplace to aid enterprises in recommending achievements; enhancing the use and dissemination of applicable technology; following up to projects; formulating "provisional measures for the organization, implementation, and rewarding of projects in S&T development planning"; and coordinating work of departments of S&T, finance, banking, and taxation to arrange for the input and matching of funds. This is the way in which Xuanchang is throwing the "Spark" match in all directions.

It has arranged for the building of technology development groups to advance the joining of research with production. Already, there have been 12 colleges and vocational schools and 19 research units that have entered this city's main "Spark" battleground. They have formed a cohesive S&T, economic, marketplace, information, and data-transmission network, and have focused attention on the development of a group of "short, level, and speedy" products that have high economic results and are marketable. The municipal S&T development center has imported advanced achievements, is using the "coordinated process" operational method that combines technology, funding, and skilled personnel to support a civil-administration enterprise bakelite electric equipment plant, and it is jointly taking responsibility for a national "Spark Plan" project, "a low-pressure plastic neon light strip." Output value grew from 1.09 million yuan in 1986 to 7 million yuan this year and profits grew from 180,000 yuan to 800,000 yuan; this activity also solved the unemployment problem for more than 20 disabled persons.

It treats the local industrial base and their technological advantages as a 'torch,' which it uses to adjust traditional industrial structures. The city realized during a survey that technology, equipment, and skilled personnel pressures for some enterprises were restricting the economic development of those enterprises. For this reason, it has initiated "Spark Plan" projects needed by the rural markets and that involve development of a hemp carder and a farm-use power-driven three-wheel vehicle. The Xuanchang Municipal Transformer Plant has been illuminated by the "Spark," has been implanted with a technology "embryo," and has thereby changed its traditional industrial structure of the past that relied solely upon increasing production volume. This has brought about a 15 percent increase in industrial output value, and the variety of its products has gone from the original dozen or so to more than 60.

In establishing this "3-3 mode" "Spark Plan" intensive demonstration townships, they have brought growth to the economy of this region. After Xuanchang included the Wujia township among its demonstration sites, it took up the "3-3 mode": the introduction of technology, funds, and equipment; equal attention to the economy, society, and the ecology; and a three-part unification of the transformation of traditional agriculture with the new mode of three-dimensional ecology, of new product development with mature technology, and economies of scale with courtyard economies. These have "melded" the "scattered" township economies into technology development groups, allowing a whole to be formed from parts; a certain atmosphere has also been created. The township has formulated a three-dimensional ecological and agricultural program where "there are fruit orchards on the mountains, vegetable gardens in the valleys, pear orchards in the floodlands, and a courtyard economy for each family." This township last year took on ten "Spark Plan" projects, into which it invested 2.58 million yuan, and from which it has already generated output value of 3.1221 million yuan, accumulating 548,000 yuan.

Prevalence of Hepatitis B Viral Markers in Hepatitis B Endemic Areas of China

40101014a Beijing CHINESE MEDICAL JOURNAL in English Vol 101 No 9, Sep 88 pp 654-658

[Article by Luo Si [5012 2448], et al., Guangxi Medical College, Nanning; Myron J. Tong, Brian E. Henderson, and Mimi C. Yu, Department of Preventive Medicine, University of Southern California School of Medicine, Los Angeles; and Liver Center, Huntington Memorial Hospital, Pasadena, California, USA]

[Excerpts] Fifty patients with primary hepatocellular carcinoma (PHC) and 49 controls were assayed for hepatitis B virus (HBV) markers by radioimmunoassay. The results showed that the hepatitis B surface antigen (HBsAg) was positive in 43 out of 50 (86%) PHC patients and in 11 out of 49 (22.5%) controls ($p<0.001$). Both anti-HBs and anti-HBc were present in six PHC patients and in 27 controls. The positive rate for at least one HBV marker was 98% (49/50) in the PHC patients. The relationship between HBsAg positivity and PHC in our young patients suggests that these individuals were infected by the HBV in their early life either by vertical transmission from the carrier mothers during the perinatal period or by close family contacts during the postnatal period. This study confirmed the strong geographic correlation between HBsAg prevalence and incidence of PHC. [passage omitted]

Material and Methods

Patients and controls. 50 patients with PHC and 49 controls from the inpatient and outpatient departments of the Guangxi Medical College affiliated hospital were studied. The diagnosis of PHC was established histologically by autopsy in four cases. The remaining patients had filling defects in their liver scans and tumor masses or enlarged livers on palpation. The controls had other diseases such as peptic ulcer, tuberculosis, nephritis and appendicitis but had no history of liver disease. The controls were matched with the PHC in sex and age. There were 47 males and 3 females in PHC group and the mean age was 43.3 years (ranging from 20 to 66 years).

Laboratory tests. The sera of patients with PHC and controls were collected and kept frozen until tested. They were brought from Guangxi to the laboratory of the Huntington Memorial Hospital Liver Center, Pasadena, California, USA. The serum samples were tested for HBsAg, anti-HBs, anti-HBc, HBeAg and anti-HBe by radioimmunoassay (AUSRIA II, CORAB, AUSAB, Abbott-HBe, Abbott Laboratories, North Chicago, Illinois). 41 patients with PHC and 44 controls were assayed for alpha-fetoprotein (AFP) by the passive hemagglutination test with an AFP kit (Beijing Bioproducts Institute) in the hospital laboratory of Guangxi Medical College.

Results

Hepatitis B surface antigen was found in 43 of 50 (86%) patients with PHC. Seven PHC patients had no detectable HBsAg, but six of these seven patients had both anti-HBs and anti-HBc (Table 1). Only one patient had no HBV markers in his serum. In our control group, of the 49 subjects,[11] (22.45%) had circulating HBsAg, 27 (55.10%) had both anti-HBs and anti-HBc positivity and one (2.04%) had anti BHc alone. However, none of the pHC patients had anti-HBc alone. The positive rate for at least one marker was 98% (49/50) in the PHC group and 87.75% (43/49) in the control group. The HBsAg positivity was significantly higher ($P<0.001$) in the PHC patients as compared with the controls.

Table 1. HBV Markers in Sera of the Controls and PHC Patients

Description	Control cases		PHC cases	
	No. of Samples	%	No. of Samples	%
HBsAg(+)	11	22.45	43	86.0
HBsAg(—), anti-HBs(+), anti-HBc(+)	27	55.10	6	12.0
HBsAg(—), anti-HBs(+), anti-HBc(—)	4	8.16	0	0
HBsAg(—), anti-HBs(—), anti-HBc(+)	1	2.04	0	0
HBsAg(—), anti-HBs(—), anti-HBc(—)	6	12.25	1	2.0
Total	49	100.00	50	100.0
Positive for HBsAg	11	22.45	43	86.0
Positive for anti-HBs	31	63.26	6	12.0
Positive for anti-HBc	28	57.13	6	12.0
With no markers	6	12.24	1	2.0
Positive for at least 1 marker	43	87.75	49	98.0

Table 2 shows the frequency of HBeAg and anti-HBe in PHC patients and the controls. The frequency of HBeAg in the patients with PHC (30.95%) was higher than that of the controls (18.18%), but the difference was not statistically significant ($P>0.05$). Seven of 11 (63.64%) control

subjects and 21 of 42 (50%) of PHC patients had anti-HBe. HBeAg was detected more frequently in the young patients and the anti-HBe more often in the elderly patients.

Table 2. HBeAg Antigen-Antibody System in Controls and the PHC Patients

Description	Control cases			PHC cases		
	No. of samples	%	Mean age (yr)	No. of samples	%	Mean age (yr)
HBeAg(+), anti-HBe(—)	2	18.18	37	13	30.95	41
HBeAg(—), anti-HBe(+)	7	63.64	44.5	21	50.00	45
HBeAg(—), anti-HBe(—)	2	18.18	39	8	19.05	38
Total	11	100.00		42	100.00	

The alpha-fetoprotein test was done for 41 PHC patients and 44 controls by the passive hemagglutination test. 29 out of 41 (70.74%) patients with PHC were positive while none of the control patients had alpha-fetoprotein in their sera (Table 3). The relationship between alpha-fetoprotein and HBsAg in the different age groups of PHC patients is shown in Figure 1.

Table 3. The Results of the Detection for Alpha-Fetoprotein in the Controls and PHC Patients

Titer for detection	Control case (%)	PHC case (%)
1:100 (+)	0	3 (7.33)
1:1 000 (+)	0	17 (41.46)
1:1 000 (+)	0	9 (21.95)
Subtotal	0	29 70.7)
(—)	44 (100%)	12 (29.26)
Total	44 (100%)	41 (100%)

Alpha-fetoprotein with passive hemagglutination test was considered positive when the sample serum was equal to 1:100 or higher

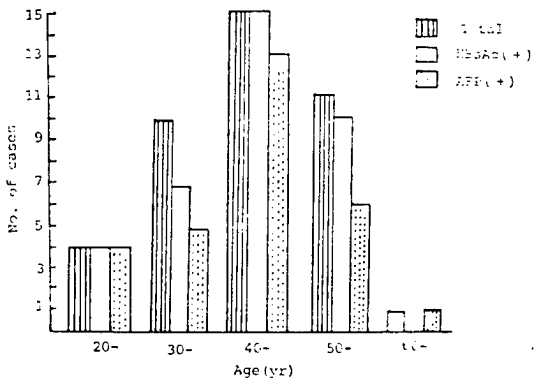

Figure 1. HBsAG +) and AFP (+) in the Different Age Groups of PHC Patients

Discussion

The geographic patterns of PHC is that it occurs predominantly in south eastern China which is a warm and humid area along the coast. Areas with the high mortality rates for PHC are Guangxi, Guangdong, Fujian, Zhejiang and Jiangsu provinces, and Shanghai.[2] The mortality rate of liver cancer (mainly PHC) is the highest (23.93 per 100 000) among all neoplasms in Guangxi. The annual mortality rate of PHC is 15.33 per 100 000 (ranging from 5 to 55 per 100 000),[10,11] and this is a major problem in Guangxi.[12]

It has been reported that HBsAg commonly present in patients with PHC in China, Singapore, Senegal and Uganda.[4-9,11,13] Our study showed that HBsAg positive rate was 86% (43/50) in PHC patients and 22.45% (11/49) in the controls (Table 1) and the difference is statistically significant ($P<0.001$). The HBsAg positivity of both groups is much higher than the corresponding figures from other countries and regions.[4-9,11,13] The presence of positivity for at least one HBV marker in our PHC patients is as high as that reported in Taiwan (98%).[13] Therefore, it strongly suggests that chronic HBV infection may be a major etiologic factor for PHC. It should be noted that only one of our PHC patients had no HBV markers in his serum.

Orcein staining of liver tissue has been attempted to elucidate the relationship between liver cirrhosis, PHC and HBsAg.[10,14-16] These studies demonstrated that the presence of HBsAg in liver cirrhosis anl carcinoma in Guangdong was 82.6%.[16] In addition, orcein staining of 338 liver specimens (142 PHC, 99 cirrhosis, 97 control) obtained from autopsy and biopsy showed 70.42% positive for HBsAg in liver tissue of PHC in Guangxi.[11]

It has been reported that viral hepatitis B may be transmitted through various ways. The major routes of infection include contaminated

needles, blood transfusion, vertical transmission from HBV carrier mothers to infants during the perinatal period, mosquito and bed-bug borne, and intimate personal life contacts.[9,17]

The incidence of PHC is significantly higher in the southern part of Guangxi and the highest mortality rate of PHC occurs in Nanning city.[11] In our study, 21 of 50 (42%) patients with PHC came from various counties of this area and their mean age was 40 years (ranging from 20 to 58). It has been reported that among the high risk Chinese, PHC is the most common malignancy in young people aged 15-34.[12] In Hong Kong, Lam, et al.[18] have reported that 44% of HBsAg positive PHC patients were under 50 years of age. These data suggest that in the endemic areas the exposure of these patients to the various etiologic agents occurred early in their life. Investigations have shown that there is a high frequency of HBsAg positive mothers among PHC patients.[19-22] Therefore, it is suggested that vertical transmission during the perinatal period from HBV carrier mothers to their infants and the long-term close family contact may be important for future development of PHC. Recently in Taiwan, a study showed that the HBsAg positive carrier state precedes the development of PHC in most cases.[22]

We have also found that HBeAg positivity was detected more frequently in the young PHC patients, whereas anti-HBe was seen more frequently in the elderly PHC patients. In general, anti-HBe is present in the PHC patients and is seen even more frequently in the elderly.[13,23]

Our observation showed that 29 of 41 (70.74%) HBsAg positive PHC patients had also positive results in alpha-fetoprotein test (Figure 1). There was a tendency for the young patients to be both HBsAg and alpha-fetoprotein positive. The titer of alpha-fetoprotein did not correlate with circulating HBsAg. The relation between alpha-fetoprotein titers and circulating HBsAg is still controversial and requires further study.[6,24-26]

Studies in Guangxi showed that the annual mortality rate of PHC closely correlated with the consumption of corn which was contaminated with aflatoxin.[11] Aflatoxin is known to be a hepatic carcinogen in many species of animals. Therefore, in some counties of Guangxi, aflatoxin may also play an etiologic role in PHC. However, Beasley, et al.[3] indicated that aflatoxin does not seem to be an independent inducer of PHC. Other environmental factors and genetic factors may be also involved in the development of PHC.

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Study of Hamsters Infected With Epidemic Hemorrhagic Fever Virus

40101014b Beijing CHINESE MEDICAL JOURNAL in English Vol 101 No 9, Sep 88 pp 675-678

[Article by Zhu Zhiyong [2612 2535 0516], et al, Zhejiang Health and Anti-epidemic Station, Hangzhou; Yu Yongxin and Dong Guanmu, National Institute for the Control of Pharmaceutical and Biological Products, Beijing; passages in slantlines published in italics]

[Text] On the basis of our results, we believe that the hamster can be used in the study of epidemic hemorrhagic fever virus (EHFV) for isolation and propagation of EHFV, production of immune serum and antigen slides, as an animal model for drug screening and vaccine testing, etc.

Our study shows hamsters are susceptible to epidemic hemorrhagic fever virus (EHFV) including wild-mouse type EHFV and house-rate type EHFV. The hamster was successfully infected by the intramuscular, intraperitoneal, subcutaneous and intrapulmonary or intracerebral (suckling hamster) routes but not by the oral route. EHFV antigen appeared in the lungs 5 days after inoculation of EHFV strain Z_5 and persisted for at least 120 days. EHFV antigen was detected in various tissues. The appearance of EHFV antibody was 10-12 days after EHFV inoculation, titres were 1:5120 at the 7th week. EHFV antigen and antibodies were found simultaneously in hamsters for a long time. Adult hamsters inoculated with EHFV showed no overt symptoms, but EHFV passaged in the brains of suckling mice causes disease and death in suckling hamsters.

After successful isolation of Hantaan virus with wild /A. agrarius/ by Lee et al., in 1978,[1] it was found that laboratory animals such as rats,[2] suckling mice,[3] /Meriones unguiculatus/[4] and rabbits[5] are all sensitive to EHFV. It is possible to select sensitive animals for research on the EHF etiology, epidemiology and pathology and for vaccine development. This study demonstrates that the hamster is also sensitive to EHFV and may provide a new animal system for EHFV study.

Material and Methods.

Animals. Adult, weanling and suckling hamsters were obtained from the Animal Center of the Shanghai Institute of Biological Products. Both sexes were used.

EHFV strains. Wild-mouse type EHFV strains Z_3, Z_4, Z_5 and Z_{10}, Hantaan 76-118 and house-rat type EHFV strains Z_{16}, R_{22}, SR-11, Z_{30} and Z_{34} were used.

Detection of viral antigen. After the animals were sacrificed, the internal organs were removed, frozen tissue sections (4 μm) examined for viral antigens by direct immunofluorescence with fluorescein isothiocyanate (FITC) conjugated polyvalent immunoglobulins of rabbit origin prepared against EHFV strains Z_3 and Z_{26}.[6]

Measurement of IF antibodies. Indirect fluorescent antibody test was performed according to the standard method. FITC-conjugated goat antiserum to mice Balb/c IgG was obtained from the Shanghai Institute of Biological Products. Slides of Vero E_6 cells infected with EHFV Z_3 strains were prepared by our laboratory.

Results

Hamster susceptibility to various EHFV strains. Our results showed that the 3-week-old hamster is susceptible to EHFV of both the wild-mouse and house-rate types. But the 3-month-old hamster has decreased susceptibility to house-rat type EHFV (Table 1 [on following page]).

Hamster susceptibility at different ages to wild-mouse type EHFV Z_5 strain. Hamsters from 3-day-old to 12-month-old were infected with 1 000 ID_{50}/0.2 ml EHFV Z_5 strain by intraperitoneal inoculation and suckling hamster with 200 ID_{50}/0.04 ml intracerebrally. They were then sacrificed 8 days after infection. The results showed no difference in the intensity of IF, i.e., viral antigen detected in the lung did not decrease with increased hamster age. (Table 2).

Table 2. Hamster Susceptibility to EHFV 25 Strain

Age (Days)	Infected animals/ No. tested	IF in lung			
3	4/4	+++	+++	+++	+++
14	2/2	+++			+++
30	2/2	+++			+++
60	2/2	++			+++
90	2/2	+++			++
130	2/2	+++			+++

Table 1. Appearance of EHFV Antigen in the Tissues of 3-Week and 3-Month Hamsters After Inoculation With EHFV Strains

Strains	Hamster No.	3-week-old			3-month-old		
		L	S	Si	L	S	Si
Z10	1	++++	++	+	—	—	—
	2	++	+	+	±	±	—
Z34	1	+	+	—	—	—	—
	2	+++	+	+	—	—	—
SR11	1	++	+	±	++	++	++
	2	++	+	++	+++	++	++
Z16	1	+++	+	+	±	±	—
	2	++	+	++	—	—	—
R22	1	++	+	++	+	+	—
	2	++	+	+	+	—	—
76-118	1	++	±	+	++	+	±
	2	++	+	±	++	+	+
Z3	1	+++	+	++	+++	++	+
	2	++	±	+	+++	+++	++
Z4	1	+++	++	++	++	++	++
	2	++	±	+	+++	++	+
Z5	1	+++	++	+++	++++	+++	++
	2	+++	+	++	+++	++	++
Z10	1	+++	++	++	+++	+++	++
	2	++++	++	+++	+++	++	++

The fluorescent reaction was graded as positive (±, +, ++, +++) or negative (—) according to the extent of the reaction. ± = positive reaction could be confirmed by careful scrutiny. L = lung, S = spleen, Si = small intestine.

Dynamic changes of hamster EHFV antigen and antibodies. EHFV antigen was found in the lung, spleen and small intestine 5-6 days after infection of 3-week-old hamsters with EHFV Z_5 strain (1 000 ID_{50}). On the 8-9th day after infection, antigen intensity reached +++ and antigen was detected in the brain. EHFV antigen could be detected in the tissue for at least 120 days. The antibodies were detected on the 10th day after infection and the titers increased gradually to the highest (1:5 120) on the 50th day (Table 3).

Table 3. Dynamic Changes of EHFV Antigen and Antibodies in Hamsters Infected With EHFV Z_5 Strain

Days after virus inoculation	No. of hamster	Antigen				Antibodies
		L	S	Si	B	
3	2	− −	− −	− −	− −	− −
4	2	+ −	− −	− −	− −	− −
5	2	+ +	+ +	+ −	− −	− −
6	2	++ ++	+ +−	++ +	− −	− −
8	2	+++ +++	+++ ++	+− +++	− −	− −
10	1	+++	+−	+++	−	1:20
12	1	+++	++−	+++	+	1:20
14	1	+++	+−	+	+	1:160
17	1	+++	+−	+	+	1:160
21	1	+++	++	+	+	1:640
30	1	+++	+−	+	+	1:640
50	2	+++ +++	++ +	++ ++	+ +	1:5120 1:1280

B = brain

Distribution of EHFV antigen in hamster tissue. Table 4 and Figure 1 [omitted] show immunofluorescent viral antigen distribution in different age hamsters after EHFV Z_5 strain (1 000 ID_{50}) inoculation. In the adult hamster viral antigen distribution was more restricted than in suckling and weanling hamsters, but the viral antigen in the lung was strongly positive (+++) in all.

Table 4. EHFV Antigen in Hamster Tissues After Infection With EHFV Z_5 Strain

Age (days)	L	S	Lv	K	H	B	Si	St	M	Sk	E	T	To
3	+++	++	+++	+++	+−	+++	+−	+++	+	++	+−	++	+
21	+++	++	++	++	+	−	+−	+−	+	+−	+−	++	−
90	+++	++	+	+	−	−	+−	−	−	−	−	−	−
180	+++	+	+	+	−−	−	−	−	−	−	−	−	−

Lv = liver, K = kidney, H = heart, St = stomach, M = muscle, Sk = skin, E = ear, T = tail, and To = tongue.

Infectivity of hamster by different routes. As shown in Table 5, hamsters were successfully infected with EHFV strain Z_5 by the intraperitoneal, intrapulmonary, intramuscular, subcutaneous and intracerebral (suckling hamster) routes, but not via the oral route.

Table 5. EHFV Antigen in Hamsters by Different Routes of Infection

Route of infection	No. of infected/ No. of animals tested
Intramuscular	2/2
Subcutaneous	2/2
Intrapulmonary	2/2
Intraperitoneal	18/18
Intracerebral	4/4
Oral	0/4

Hamster reactions after EHFV inoculation. Adult and weanling hamsters inoculated with wild-mouse or house-rat type EHFV showed no overt symptom and no striking characteristic histopathologic changes could be found. They were thought to have asymptomatic, persistent infections as /Apodemus agrarius/. Suckling hamster's reaction to various EHFV strains of infection was different. The EHFV which was passaged in the brains of suckling mice caused disease in suckling hamsters, they died 10-15 days after inoculation. But some of them were still alive and carried the virus for several months.

Discussion

Our studies indicate that the hamster is also a sensitive laboratory animal host for EHFV. It is susceptible to both the wild-mouse and house-rat types of EHFV, the viral antigen is detectable in many organs of the infected animals. Adult and weanling hamster infected with EHFV showed no overt disease, but in the suckling hamster it caused death when the infectant was a strain with high virulence after series passage through the brain of suckling mice. Hamsters were successfully infected by the intramuscular, intrapulmonary, subcutaneous, intraperitoneal and intracerebral (suckling hamster) routes. EHFV persisted in hamsters for more than 4 months and specific antibodies to EHFV were detected.

Comparison of the hamster with other sensitive animals showed some differences. Adult hamsters were more sensitive to wild-mouse type EHFV than to house-rat type EHFV. On the contrary, laboratory rats were more sensitive to house-rat type than to wild-mouse type EHFV.[2] However, /Apodemus agrarius/,[2] /Meriones unguiculaus/[4] and the rabbit[5] are sensitive to both types of EHFV. EHFV persists in the hamster for a long time, and it has higher titres of blood immunofluorescent

antibodies (1:5 120). This is true also in natural reservoir animals (/A. agrarius/ and laboratory rats).

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Synthesis, Decomposition, and Production of Para-Cycloamine-Methylphenylalanine

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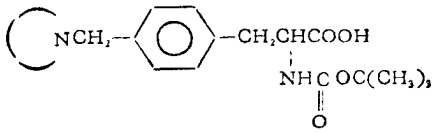
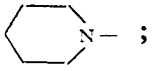
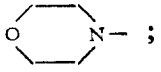
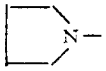
[Summary] The synthesizing of natural peptide analogues with specific configuration provides an important method to study the relationship between peptide structure and its function and a way to search for the more efficient and less toxic peptide drugs as well. There are several ways to study the specific structure of the natural peptides: (1) by introducing new chemical bonds into the primary chain of the peptides, for example, by changing the carbonyl group (CO-) of the amido bond into sulfacarbonyl bond; (2) Structural changes of amino acid side chains by introducing non-natural amino acids or by modifying the side chains of natural amino acids; and (3) by introducing a D-type amino acid which can effectively inhibit the hydrolysis of the peptide chain by protease in the body, hence changing the peptide configuration. In this experiment, compound D,L-N-acetyl phenylalanine was taken as an initial reactant, and para-cycloamine-methylphenylalanine final products were obtained through reaction and decomposition processes. The following is the basic structure of the final products:

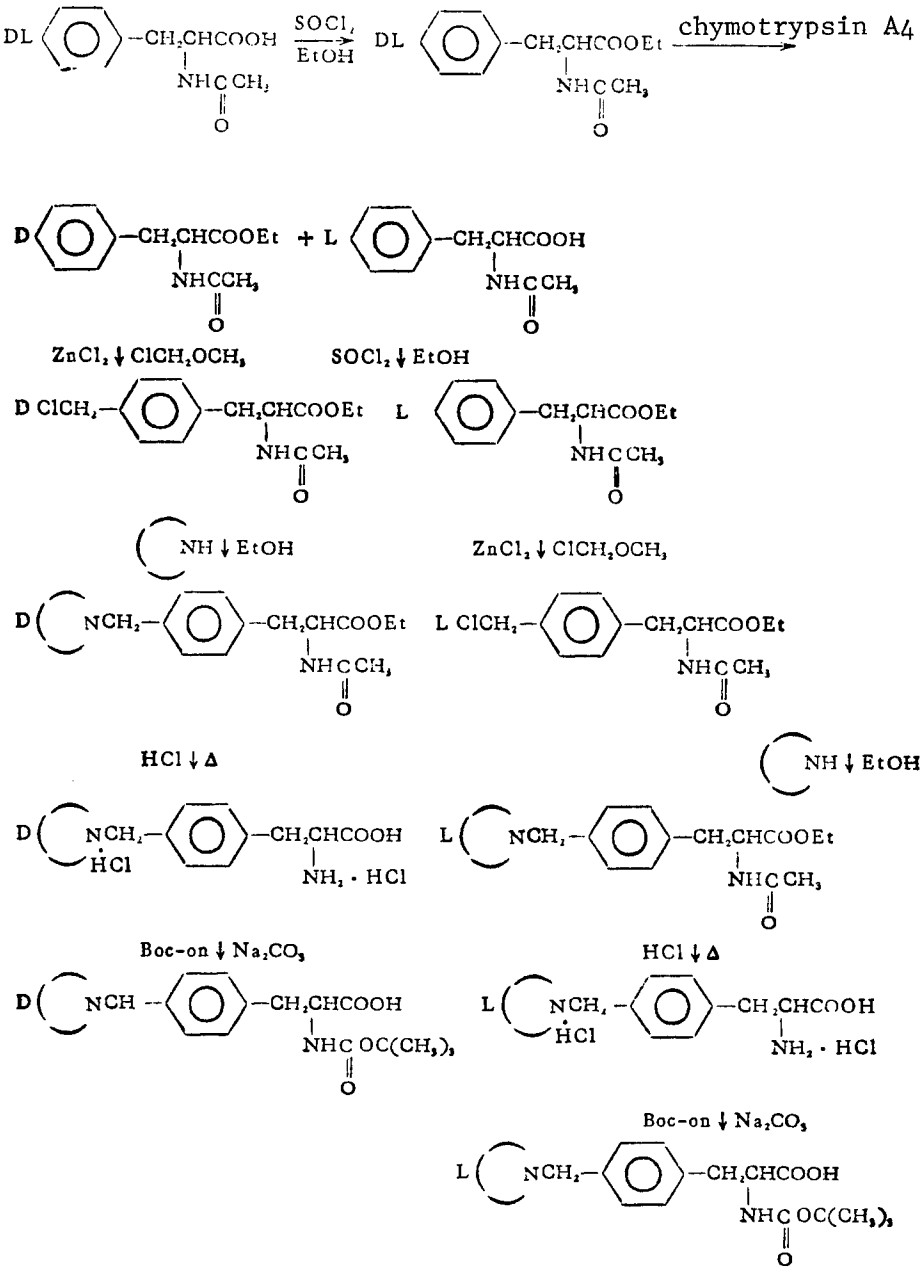


here:  represents  ;  ;

and



Synthesis Pathway:



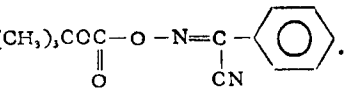
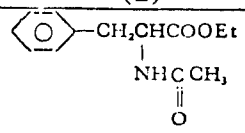
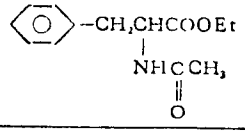
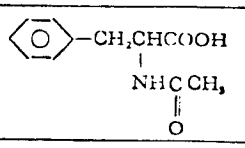
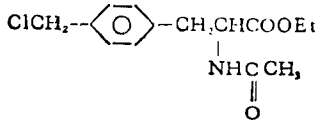
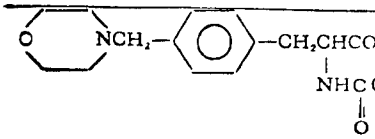
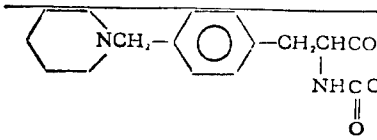
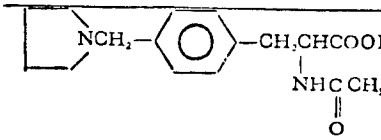
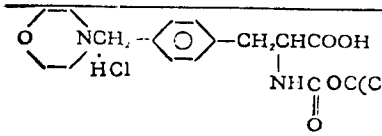
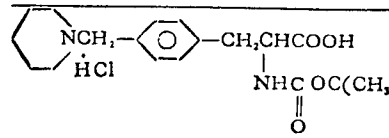
here Boc-on is  .

Table 1. Testing Results of the Compounds

结构式 (1)	构型 (2)	C H C(%)	$[\alpha]_D^t$	收率 (%) (3)	熔点 (℃) (4)
	DL	———	———	92	67—9
	D	———	$[\alpha]_D^{15} = -14.0°$ (C = 1, 无水乙醇)(5)	99	88—90
	L	———	$[\alpha]_D^{15} = +14.2°$ (C = 1, 无水乙醇)(5)	91	89—91
	L	———	$[\alpha]_D^{15} = +43.0$ (C = 1, 无水乙醇)(5)	94	166—8
 $C_{14}H_{18}NO_3Cl$	D	(7) 计算: 59.22 6.41 4.94 (8) 测试: 58.99 6.65 5.10	$[\alpha]_D^{15} = -20.0°$ (C = 1, 无水乙醇)(5)	49.2	92—5
	L	59.14 6.44 4.68	$[\alpha]_D^{15} = +20.0°$ (C = 1, 无水乙醇)(5)	43.1	92—5
 $C_{18}H_{24}N_2O_4$	D	计算: 64.62 7.86 8.38 测试: 64.93 8.16 8.13	$[\alpha]_D^{15} = -18.67°$ (C = 0.6, 95%乙醇) (6)	89	79—81
	L	64.49 8.25 8.17	$[\alpha]_D^{15} = +18.22°$ (C = 0.45, 95%乙醇) (6)	81	78—81
 $C_{19}H_{28}N_2O_3$	D	计算: 68.61 8.51 8.43 测试: 68.59 8.92 8.54	$[\alpha]_D^{15} = -19.17°$ (C = 0.6, 95%乙醇) (6)	92.1	80—2
	L	68.40 8.70 8.62	$[\alpha]_D^{15} = +19.22°$ (C = 0.56, 95%乙醇) (6)	90	79—81
 $C_{19}H_{26}N_2O_3$	L	计算: 67.86 8.25 8.80 测试: 67.70 8.45 8.43	$[\alpha]_D^{18} = +19.2°$ (C = 1, 95%乙醇) (6)	57.2	55—7
 $C_{19}H_{29}N_2O_3Cl$	D	计算: 56.89 7.31 6.99 测试: 56.31 7.45 7.12	$[\alpha]_D^{15} = -17.7°$ (C = 0.6, 95%乙醇) (6)	73	—
	L	56.54 7.67 7.72	$[\alpha]_D^{15} = +17.5°$ (C = 0.6, 95%乙醇) (6)	80.4	—
 $C_{20}H_{31}N_2O_4Cl$	D	计算: 60.18 7.85 7.03 测试: 60.50 8.10 6.96	$[\alpha]_D^{15} = -15.0°$ (C = 0.6, 95%乙醇) (6)	69.4	—
	L	59.83 8.17 6.83	$[\alpha]_D^{15} = +14.2°$ (C = 0.6, 95%乙醇) (6)	54	—

Key: (1) Chemical Structure
(2) Configuration
(3) Recovery rate (%)
(4) Melting point (°C)
(5) Dehydrated alcohol
(6) 95% alcohol
(7) Calculated
(8) Tested

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[1] Brenner, M. and Huberr, W., Helv. Chim. Acta, 36 (1953), 1109.

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Molecule Orbital Index and Its Correlation With Anti-Toxin Efficacy of Di-Pyridine-Penta Ammonium Salt

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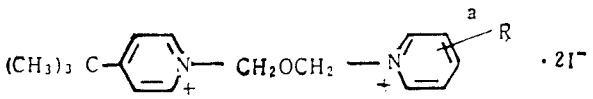
[Summary] In order to find an effective drug to resist organic phosphate poisons, a compound of the di-pyridine-penta ammonium salt type was synthesized. The following is its basic chemical structure:



(I) (II)

when a=3, R=COR' (R' can be alkyl, aryl or amine group), $CHOHC_4H_9$

a=4, R=COC_4H_9(n), $COC_6H_4OCH_3$(p)

Table 3. Compound Structures and Molecular Orbital Indices

NO.	a	R	N2	C12	C13	C14	C15	C16	SCLAP	RC
1	3	COCH3	—0999	—3072	2008	—3741	—0681	4120	A	.9124
2	3	COC2H5	—0792	—3240	1841	—3607	—0669	3975	A	.9769
3	3	COC3H7 (n)	—0794	—3241	1840	—3611	—0668	3978	A	.9781
4	3	COC3H7 (i)	—0903	—3159	1875	—3706	—0633	4058	A	.9578
5	3	COC4H9 (n)	—0794	—3241	1841	—3611	—0668	3978	A	.9781
6	3	COC4H9 (i)	—0793	—3243	1841	—3611	—0668	3978	A	.9787
7	3	COC5H11 (n)	—0794	—3241	1841	—3611	—0668	3978	A	.9781
8	3	COC5H11 (i)	—0801	—3236	1850	—3614	—0671	3983	A	.9756
9	3	COC5H9 (c)	—0921	—3140	1929	—3708	—0654	4072	A	.9448
10	3	COC6H13 (n)	—0794	—3241	1841	—3611	—0668	3978	A	.9781
11	3	COC6H11 (c)	—0935	—3131	1890	—3727	—0626	4078	A	.9518
12	3	COC7H15 (n)	—0794	—3241	1841	—3611	—0668	3978	A	.9781
13	3	COC6H5	—0491	—1529	0787	—1786	—0271	1987	A	.9023
14	3	COC6H4COH3 (p)	—0761	—1417	1018	—2067	—0283	2274	A	.9175
15	3	COC6H4CH3 (p)	—0625	—1475	0896	—1926	—0273	2129	A	.9055
16	3	COC6H4Cl (p)	—0273	—1383	0519	—1404	—0210	1567	A	.6857
17	3	COC6H3Cl2 (m, p)	—0259	—1313	0467	—1332	—0184	1481	A	.6215
18	3	CONH2	5279	—3005	—2131	6210	—1350	5194	B	.1151
19	3	CONHC3H7 (n)	5393	—3312	—2042	6211	—1478	5102	B	.0873
20	3	CONHC4H9 (n)	5393	—3311	—2042	6211	—1478	5102	B	.0874
21	3	CHOHC4H9(n)	—5863	5229	1174	—5885	2288	4177	B	.0004
22	4	COC4H9 (n)	—4309	2678	2522	—2917	2914	2353	B	.7605
23	4	COC6H4OCH3 (p)	—3465	2261	1716	—2696	1889	2220	B	.7137

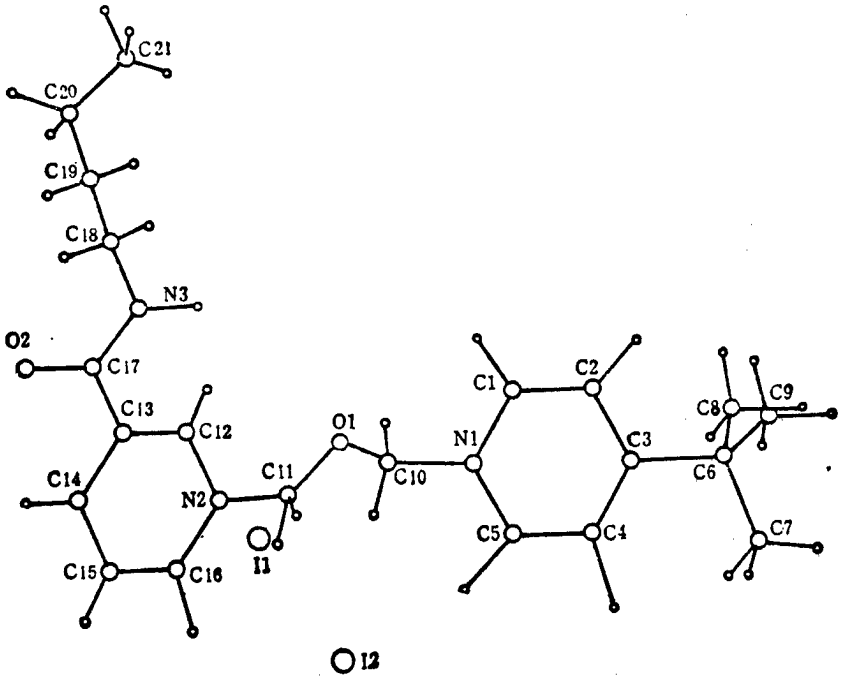
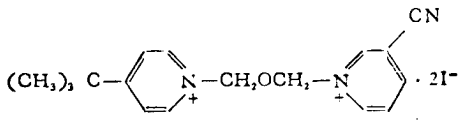
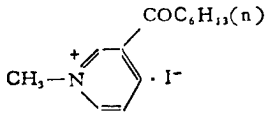


Figure 1. Molecular Structure of Compound 20

When R on the third position is replaced with the acyl group (RCO-), the synthesized compound is more effective against organic phosphate toxin than the compounds HI-6 and HGG-42. Based on the pharmaceutical test results shown in Table 3, the molecule orbital indices greatly affect anti-toxin efficacy of the organic compounds, the more effective anti-toxic compounds (Nos. 1-17), which show regular A-type SCLAP [signs of coefficients of the LUMO on atoms in pyridinium ring II] arrangements, have higher carbonyl carbon RC [reduced charge] values, the other six compounds (Nos. 18-23) lacking anti-toxic effects show irregular B-type arrangements and lower RC values. Two new compounds (24, 25) were thus synthesized to prove the above deduced results. Compound 24 has an A-type SCLAP arrangement and 0.5187 cyano carbon RC value, the compound was predicted to be anti-toxic, and the pharmaceutical test has proven it, the ED_{50} of compound 24 against organic phosphate 1LD poison is 35.4 mol/kg; Compound 25 with a B-type SCLAP arrangement, and 0.0748 carbonyl carbon RC value was thought to be non-antagonistic and it has been proven to be so. An important experiment conducted in this laboratory was the use of ^{125}I-labelled α -cobra toxin to test the synthesized compounds' antitixicities by using receptor (cobra-toxin)-ligand (organic compounds) binding competitive method, by which the excretion and catabolism rates were measured. The results demonstrated that the compounds with higher anti-toxic efficacy had stronger N-receptor bindings, the excretion and catabolism rates at concentration of 10^{-3} mol/l of cobra toxin were 76-100 percent, and the rates were still over 35 percent even when the concentration was only at 10^{-7} mol/l. The compounds without anti-toxic efficacy showed no obvious excretion and catabolism effects. From these results, the synthesized compounds' selectivities over N-receptor binding sites of α -cobra toxin were clearly elucidated.



24



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Examination of the Hybrid Strain of Shigella Sonnei and Bacillus Typhis Murium (Mouse Typhus)

40081025 Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 6, Dec 88 p 344

[Article by Mou Zhaoqin [3664 0340 2953], Xing Li [6717 7787], Mao Peiji [3029 1014 1015], Microbial Epidemical Disease Institute, Military Medical Science Academy, Beijing]

[Summary] A bivalent hybrid strain bacterium (GS strain) has been obtained by using attenuated mouse typhus bacterium (Bacillus typhis murium) strain G30 as a recipient strain and Shigella sonnei with I-form macroplasmid (120 Mdal) as a donor strain, the I-form macroplasmid was transfered to B. typhis G30 successfully by the motivation-inducing plasmid R 386 through bacterial conjugation process. The recipient strain B. typhis G30 imported from Australia is a galactose epimerase mutant (gal E), which will not propagate in the body of the innoculated mouse, it cannot be recovered when injected into the animal, and the G30 strain immunized mice show obvious protection effect against B. typhi murium. The results from the agarose gel electrophoresis could indicate the success of the incorporation; the serological test proved that the GS strain expresses the characteristics of either 04, 05, and Hi antigens of B. typhi, or I-form antigen of S. sonnei as well. The hybrid GS strain is neither toxic to the mice (LD_{50}=10 x 10^8), nor keratitis-causing by Sereny test. Antibodies against both S. sonnei and B. typhi could be found in sera of the innoculated rabbits, the titers were 1:320 and 1:5120 respectively. Obvious protection against S. sonnei and B. typhi attacks were found in the LACA mice--the survival rates were 81.3 percent and 73.3 percent for S. sonnei and B. typhi.

Plasmid Fingerprinting Analysis of Shigellae Isolated from Northwest China

40091021a Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 6, Dec 88 pp 341-344

[English abstract of article by Xie Guilin [6200 6311 2651] of the Department of Microbiology, Lanzhou Medical College; Wang Bingrui [3769 4426 3843], et al., of the First Laboratory, Lanzhou Institute of Biological Products, Ministry of Public Health]

[Text] The authors have completed the plasmid profiles of 189 Shigellae strains of the main epidemic groups and serotypes isolated from Lanzhou, Xining and Yinchuan cities in recent years. The results show that 86 percent of the Sh. sonnei strains from the three cities had two plasmid profile patterns, 76 percent of the Sh. flexneri 1 strains and 86 percent of the Sh. flexneri 6 strains shared a single pattern, and all Sh. flexneri 2 exhibited three patterns. The plasmid profile of Sh. flexneri 1 and 6 isolated from different cities was quite stable for 2 years, but the plasmid profiles of Sh. sonnei and Sh. flexneri appeared slightly different depending on the location and year. The Hind III endonuclease restriction digests of the plasmid DNA with the same or similar plasmid profiles were nearly identical in agarose gel electrophoresis. In addition, the primary analysis indicated that no clear correlation existed between the plasmid profile and the antibiotic-resistant pattern of these strains.

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Study of ETEC/CFA/I Gene Fragment Cloning, Preparation of Genetic Probe

40091021b Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 6, Dec 88 pp 349-352

[English abstract of article by Zhang Zhaoshan [1728 0340 1472], et al., of the Institute of Biotechnical Sciences, Academy of Military Medical Sciences, Beijing]

[Text] CFA/I [Colonization Factor Antigen/I] plasmid isolated from E. coli H10407 was purified in a cesium chloride density gradient centrifugation and digested with restriction endonuclease Bgl II. After electrophoresis, the 3.2 Md Bgl II fragment was recovered, recombined with pUC8 DNA predigested with BamHI, and then the ligation mixture transformed into E. coli JM83. The recombinant plasmid p^{ECO^8}, which contained the 3.2 Md Bgl II fragment, was cut with Hind III, and the 1.4 Md fragment was recovered, labeled, and then used as a probe to detect ETEC [Enterotoxin E. coli]. The results showed that the probe was highly specific and sensitive. It will be useful not only for the selection of recombinants in laboratories, but also for large-scale epidemiological studies.

Table 1. Test Strains

Strains	CFAs	Origin
E. coli 44813 (H10407)	CFA/I$^+$	Department of Microbiology, Fujian Medical College
E. coli 44814 (H10407p)	CFA/I$^-$	Department of Microbiology, Fujian Medical College
E. coli E-100	CFA/I$^+$	Department of Microbiology, Fujian Medical College
E. coli E-100p	CFA/I$^-$	Department of Microbiology, Fujian Medical College
E. coli 44815	CFA/II$^+$	Department of Microbiology, Fujian Medical College
E. coli 54R80	CFA/I$^+$	Division of Enteric Pathogens, Central Public Health Laboratory, England
E. coli 54R8	CFA/I-1$^+$	Division of Enteric Pathogens, Central Public Health Laboratory, England

Strains	CFAs	Origin
E. coli C600		Institute of Biotechnical Sciences, Academy of Military Medical Sciences
E. coli RR1		Institute of Biotechnical Sciences, Academy of Military Medical Sciences
E. coli HB101		Institute of Biotechnical Sciences, Academy of Military Medical Sciences
E. coli JM83		Institute of Biotechnical Sciences, Academy of Military Medical Sciences
Sh. sonnei		Hospital 302, PLA of China
Sh. flexneri 2a, 2b		Hospital 302, PLA of China
Sh. parashigae		Hospital 302, PLA of China
other ETEC		Beijing Children's Hospital
E. coli 83549	K88	Institute for the Control of Veterinary Bioproducts and Pharmaceuticals, Beijing
E. coli 83920	F41	Institute for the Control of Veterinary Bioproducts and Pharmaceuticals, Beijing
E. coli	K99	Institute for the Control of Veterinary Bioproducts and Pharmaceuticals, Beijing
E. coli	987p	Institute for the Control of Veterinary Bioproducts and Pharmaceuticals, Beijing

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Analysis of Epitopes, Their Densities of Group Determinant a on Hepatitis B Surface Antigen with Anti-a Monoclonal Antibody

40091021c Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 6, Dec 88 pp 375-378

[English abstract of article by Li Zhiru [2621 1013 1172], et al., of the National Institute for the Control of Pharmaceutical and Biological Products, Beijing]

[Text] Five anti-a monoclonal antibodies (McAbs) were selected and directed to separate epitopes of group determinant a on hepatitis B surface antigen (HBsAg). The method had been set up to define the quantitative differences of these epitopes on HBsAg by McAbs with ^{125}I-labeled rabbit anti-mouse immunoglobulin antibody (^{125}I-R-M-Ab). The differences in epitope numbers on HBsAg are expressed as epitope densities.

Each of five epitopes was of the same density in three HBsAg subtypes (adr, five samples; adw, three samples; ay, four samples). The average epitope densities identified by five McAbs (MHSA 11, 1H9-G11-D7, MHSA 1, 3C1-H7 and 2B8-E8) on 12 HBsAg samples were 39 ± 3 percent, 27 ± 2 percent, 17 ± 2 percent, 12 ± 2 percent and 6 ± 1 percent, respectively.

The three epitope densities identified by 1H9-G11-D7, MHSA 1 and MHSA 11 on a yeast derived recombinant HBsAg were statistically different from those on plasma derived HBsAg and cell derived recombinant HBsAg ($P < 0.05$). There were some changes among them of the group a determinant.

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HBsAg Specific Circulating Immune Complexes of IgA Class in Hepatitis B

40091021d Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 6, Dec 88 pp 379-382

[English abstract of article by Peng Xuanxian [1756 1357 2009] of the Department of Biology, Jiangxi University; Fang Liang [2455 0081] of the Department of Virology, Xi'an Medical University]

[Text] An ACCA-ELISA (IgA complex capture assay) method was established to detect the HBsAg/IgA-CIC of 236 cases of hepatitis B and HBsAg carriers. The positive rates of specific HBsAg/IgA-CIC in acute hepatitis B, HBsAg carriers, chronic persistent hepatitis B, chronic active hepatitis B, severe hepatitis B and cirrhosis after hepatitis B were 3.3 percent, 6.5 percent, 14.3 percent, 43.9 percent, 55.6 percent and 59.2 percent, respectively, while in patients with low levels of serum C_3 the rate was significantly higher than in those with normal levels. The results suggest that the positive rates are related to the damage degree of the liver, and HBsAg/IgA-CIC may be an important substance involved in activating an alternate pathway. The method is simple, specific, sensitive and reproducible.

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Studies on Growth of Production Strains of Leptospires in Protein-Free Chemically Defined Medium

40091021e Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 6, Dec 88 pp 383-386

[English abstract of article by Li Shizheng [2621 0013 2398], et al., of Chengdu Institute of Biological Products, Ministry of Public Health]

[Text] A protein-free chemically defined medium for the cultivation of the production strains of leptospires is described. The medium is composed of resin-treated Tween 80, sodium glutamate, ammonium chloride, ferriammonium salt, pyruvate, glycerin, a chelating agent, vitamins, trace metallic elements and a phosphate buffer. It supports excellent growth even for small inocula of the 15 production strains representing 8 serovars of the 7 serogroups of pathogenic leptospires, but maximal growth can only be obtained under aerated conditions.

The medium has been used successfully for the production of a polyvalent leptospiral vaccine with good antigenicity and immunogenicity. The vaccine is safe and the reaction following inoculation is very mild. It has been proved efficacious in protecting farmers of the endemic areas against leptospirosis.

The medium has the advantages of containing no protein and, therefore, no allergenicity. It is easy to prepare and is suitable for fermenter cultivation. The production costs are low in comparison with the conventional media of any kind.

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Analysis of T Cell Antigen Receptor Gene Rearrangement, Transcription in Two Lines of Murine Early T Cell

40091021f Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 6, Dec 88 pp 387-391

[English abstract of article by Chen Weifeng [7115 1983 1496] of the Department of Immunology, Beijing Medical University; Wendy D. Cook of the Ludwig Institute of Cancer Research, Melbourne Branch, Australia]

[Text] The T cell antigen receptor gene rearrangement and transcription have been analyzed in the cells of two murine early T cell lines. These two cell lines developed in the author's laboratory express the phenotype of Thy-1$^+$Lt2$^-$-L3T4$^-$, and are referred to as C2 and C320 cells. In Southern blot analysis, both the C2 and C320 cells have completed the TCRβ gene rearrangement, which is manifested as the deletion of 9.5 kb of the germ line band in the Hind III enzyme digested DNA fragment. The TCRγ gene rearrangement has been completed in the C2 cells, but the two germ line bands remain, while in the C320 cells the TCRγ gene rearrangement has been entirely completed since all the germ line DNA bands have been deleted.

Both the C2 and C320 cells have completed TCRα, β and γ gene transcription. The pattern of the TCR mRNA expression is almost identical in the C2 and C320 cells. In Northern blot analysis, the transcription of the TCRγ gene in both cells is incomplete, as revealed by the 1.0 kb band of mRNA, the mRNA bands of the TCRβ chain are shown as complete (1.3 kb) and incomplete (1.0 kb) transcriptions in both the C2 and C320 cells, and the mRNA bands of the TCRα chain were also shown as complete (1.6 kb) and incomplete (1.3 kb, 1.0 kb and 0.6 kb) transcriptions. These indicate that the functional mRNA of TCRα and β chains have been completed in the C2 and C320 early T cells.

When C2 cells expressed the mRNA of Igμ, however, the Ig_K gene was neither rearranged nor transcripted in the C2 and C320 cells, suggesting that these two cell lines are early T cells.

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Study of Protective Effect of Antigen A of Vibrio Cholerae Lipopolysaccharide with Monoclonal Antibodies

40091021g Beijing ZHONGHUA WEISHENGWUXUE HE MIANYIXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 6, Dec 88 pp 392-395

[English abstract of article by Zhu Lan [2612 5695], et al., of the Institute of Epidemiology and Microbiology, Chinese Academy of Preventive Medicine, Beijing]

[Text] Seventeen hybrid cell lines producing monoclonal antibodies against the group-specific lipopolysaccharide (LPS) antigen (A) of Vibrio cholerae 01 have been established. The agglutinating titer of McAbs was 1:800 to 1:52100 against V. cholerae El Tor Ogawa 79004, and 1:400 to 1:25600 against El Tor Inaba 805. The hemagglutination titer was from 1:256 to higher than 1:8192 against sheep red cells coated with the LPS of Ogawa, and from 1:512 to higher than 1:8192 against red cells coated with the LPS of Inaba. From Western blot analysis it was evident that these McAbs reacted with antigen A bands of Ogawa and Inaba. These results suggest that the McAbs were anti-group-specific antigens of V. cholerae 01.

The protective effect of the McAbs was studied with a vibriocidal assay and infant mice protective assay. The vibriocidal titer of McAbs of 17 hybrid cell lines was from 1:1600 to 1:409600 against Ogawa, and 1:1600 to 1:102400 against Inaba. The protective titer of McAb of six hybrid cell lines ranged from 4128 to 21008 PD_{50} units per ml against an experimental challenge with Ogawa, and from 1448 to 19548 PD_{50} units with Inaba.

The results demonstrate that the group-specific antigen of V. cholerae LPS is a potent protective antigen, and its corresponding antibody has a highly protective effect against challenge infections with the two serotypes of Vibrio cholerae.

Titer of McAbs and Serum of Rabbit Anti-V.c 79004

Test	Antigen (V.c)	Antibodies McAb[1]	Anti-79004 (rabbits)
ELISA	79004 live	800-12800	12800
	79004	800-51200	10240
Agglutination	805	400-25600	ND
	NAG		ND
Hemagglutination	79004 LPS	256->8192	3200
	805 LPS	512->8192	3200
Vibriocidal assay	79004	1600-409600	6400
	805	1600-102400	ND
Infant mice test[2]	79004	4128-21008	12233
(PD_{50} units/ml)	805	1488-19548	3299

[1] The titer range of 17 McAbs
[2] The titer range of 6 McAbs

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Computer Industry Seventh, Eighth 5-Year Plans Described

40080110a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 48, 14 Dec 88 pp 1-2

[Article entitled: Conditions Are Excellent for Executing Seventh 5-Year Plan for the Computer Industry, and Eighth 5-Year Plan Will Achieve Even Greater Heights"]

[Text] At a national conference on computing efforts and software efforts, Deputy Chief of the Computing Section of the Ministry of Computers and Electronics, Yang Tianxing [2799 1131 5887], reported on "an explanation of the situation regarding execution of the Seventh 5-Year Plan for the computer industry and initial concepts for the Eighth 5-Year Plan." He discussed the situation regarding completion of such things as production, research and development, technology transformation, and capital construction in the computer industry in China during the period of the Seventh 5-Year Plan, and the situation regarding utilization of funding. He also discussed existing problems and several major efforts to be made during the next two years. He said that plans for gross output value for the computer industry during the Seventh 5-Year Plan call for 5 billion yuan, and viewed from the implementation situation of the past 2 years, progress has been excellent. It is expected that we will have achieved 2.4 billion yuan for 1988, a growth of 18.7 percent over that for 1987. Facilitation of key S&T projects during the Sixth and Seventh 5-Year Plans has allowed China to make rapid progress in the growth of computer technology and in product renewal and transformation, which has greatly reduced the gap between computer technology in China and the level of international computer technology. This has been especially true with our excellent achievements in aspects of micro- and minicomputers and their accompanying peripherals. The model 0520 microcomputer system has rapidly become the dominant model within China, and the Taiji 2220 and 2230 superminicomputers and the model 8060 mid-size computer have also come onto the market. In addition, small-batch production has given domestic computers an increasingly greater market share, which during 1987 reached 56 percent.

When speaking of national major and key S&T projects during the period of the Seventh 5-Year Plan, Yang said that after completion of these key plans, we will have accomplished the Sinicization of the technology for 16-bit computers and for six important peripherals that accompany them. We will also have achieved batch production of these things, replacing their import; we will have developed 32-bit supermicrocomputers and five peripherals for those systems, and there will be batch production of the 0600 series of 32-bit general-purpose microcomputer engineering workstations, which will also replace imports. We will have about two-thirds the domestic microcomputer market. In the area of software, we will be formulating a number of software standards for China and will have completed 25 products for use in artificial-intelligence expert systems, in English-Chinese (or Japanese-Chinese) machine translation systems, in image-processing systems, and in voice recognition and synthesis systems, all of which software products or applications systems will meet standards of the early 1980s. The last 2 years of the Seventh 5-Year Plan will be the 2 years during which we will see the effects of the various investments of the Seventh 5-Year Plan, and the will also be 2 years in which to prepare for developments during the Eighth 5-Year Plan. Therefore, we must make our greatest efforts in attending to the work of these last 2 years: we must actively open up new markets both within China and outside it. We must enable more than 200 research and development contracts to produce achievements early, and to produce more achievements; and we must also enable research achievements to be transformed into products and commodities as quickly as possible. We must strengthen management and dispatching to accomplish projects already in planning for previous years in a way that ensures both quality and quantity; we must correctly implement preferential policies for smaller products; we should further clarify primary directions, improve the results of funding, and product more from less investment; we should dynamically manage computer production sites, and introduce competitive mechanisms; and we should include in our industrial management those enterprises and public agencies that were not included within computer industry planning before.

Deputy Chief Yang also proposed initial considerations for the Eighth 5-Year Plan in three areas: guiding ideology, developmental goals, and major projects and measures.

He said that on the basis of China's computer industry through the Sixth and Seventh 5-Year Plans, and after growth and development through the Eighth 5-Year Plan, there should be a significant leap forward in quality, and a major upturn should be apparent. In more detail, the third generation of computer technology will evolve into the fourth generation; we will change form a manufacturing economy into an economy of scale; and we will change from a domestically oriented economy into an export-oriented one. Therefore, our guiding ideology should be to continue to implement the policy of "building industry in accordance

with use," we should have a view toward the two markets, we should focus on keeping up with advances in science and technology and the expansion of exports, and we should form economies of scale by reliance upon industrial groups.

By "building industry in accordance with use," we mean dealing with the urgent need for equipment and technology transformation in the major sectors of the national economy, which are: energy resources, transportation, metallurgy, petroleum engineering, light industry, machinery, agriculture, and education. We mean to treat them as the prime arenas for computer industry services and development. We would then work hard to facilitate S&T advances and "Taiji" project planning.

We will expand exports and quickly build a group of key enterprises that are export-oriented, and will export computer components and low-grade products, as well as software products. By relying on industrial groups, we can build and form industrial colonies that are of varied forms of ownership and of multi-level structure. We can also make full use of foreign capital, can make great efforts to develop the three-way-funded enterprises, and can simultaneously attract funds from society and local areas, and encourage self-funding at the basic levels. We can adopt dynamic positioning of the distribution of major projects or products, can overcome their obsolescence, and continually refurbish, all of which will bring about growth.

Developmental goals to be implemented in the Eighth 5-Year Plan include establishment of a technology base for China's fourth-generation computers and initiation of the building of a computer information industry (including hardware, software, peripherals, applications, and information services) that is guided by demand, stimulated by S&T advances, directed by exports, centered upon software, and oriented in major products toward applications that integrate micro- and minicomputers with electromechanics. This industry should have significant technological power, a definite economy of scale and capacity for contingency, and be able to compete in world markets.

Gross output value for the computer industry during the period of the Seventh 5-Year Plan is targeted at 5 billion yuan, and that for the period of the Eighth 5-Year Plan will be three times as great. The average annual rate of growth will be 25 percent.

In order to accomplish this goal, we must continue to implement the "Taiji" project plans, and we must transform and construct a number of major projects: system design and design-automation centers; production technology centers for new techniques and new structures; software product development centers; system engineering technology centers; modern computer factories; 5-10 key software enterprises; 10 specialty service enterprises oriented toward users in metallurgy, electric power, banking, light industries and textiles, petrochemicals, transportation, agriculture, machinery, and electronics; magnetic-recording and

magnetic optical recording equipment design production centers; printer production and manufacturing centers; production lines for larger computers; and computer information processing service systems. During the period of the Eighth 5-Year Plan, we will also focus on the construction of three export bases and the transformation of 10 enterprises and 20 export-oriented production lines to allow them to become key export enterprises, which will accomplish the evolution from domestic-oriented industries into export-oriented industries. In order to put the initiative and authority for development of the computer industry truly into its own hands, and to enable the computer industry to experience a qualitative leap, two breakthroughs will be vigorously sought during the Eighth 5-Year Plan: one will be to concentrate funds on the construction of two software development, production, and export bases; a second will be to gather funds from many sources to build a design and production plant exclusively to deal with ASIC [application specific ICs] circuits for computer products. This plant will focus on providing ASICs for computer products and systems, and [thus] to take a key step in furthering the campaign for domestic production and maintenance.

Remote-Sensing Information System Debuts

40080110c Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese
No 49, 21 Dec 88 p 15

[Article by Wang Zheng [3769 1513] and Ren Fuhu [0117 0126 5706], Department of Geography, Beijing University: "The GIS Tool PURSIS"]

[Text] Natural resource sand environmental data systems, also called geographical information systems (GIS), form on "intelligentized" high technology that has developed rapidly over the past dozen or so years and that has received worldwide respect. It belongs to a frontier discipline that is situated among those of information science, space science, and earth science, and at the same time is a new technology that closely integrates computer technology, remote sensing technologies, information engineering, and geographical applications. It is capable not only of storing various statistical data, graphics data, and remote-sensing images into a computer, but can also undertake management via the computer; this includes entry, storing, retrieval, recall, editing/updating, and output. In addition, it can also edit, measure, calculate, and analyze. Even more important is its ability to generate the information that is needed; its ability to serve the surveying, monitoring, forecasting, dividing, planning, and managing of decision-making goals; its ability to replace human mental effort; and its role in adding intelligence.

To build a GIS that serves the goals of so many applications, the Department of Geography of Beijing University began in 1986 to develop GIS tool software (system maintenance software). PURSIS (Peking University Remote Sensing Information Systems) was developed for the IBM PC/XT, AT and their compatibles. In addition to its basic function as GIS general-purpose software, for such things ad the entry, storage, management, analysis, processing, and output of geographic and space data, the PURSIS system uses some rather complex techniques to overcome various speed and capacity limitations of the microcomputer. In comparison with other systems, this provides it with the following characteristics:

1. Using software technology, it builds an excellent interface working environment to input and edit graphics, which allows the user to conveniently enter and revise various digitized geographic images;

2. Using compression coding techniques to store graphics and image data greatly lightens the space burden on the system and allows the possibility of building graphics/image libraries on a microcomputer;

3. An independently designed highly efficient data-format conversion algorithm allows vector data to be rapidly converted into network data;

4. Independently designed COLOR 136 software expands the 16 colors supported by the inexpensive COLOR-400 card or the EGA card to 136 colors;

5. Software techniques are employed to solve the problem of image roaming;

6. Solution of the problem of concurrent operation for image data and attribute data allows the user to perform various operations on the logical concept of the image;

7. On the basis of entering small quantities of contour lines, it sues the method of point-to-point weighed average interpolation to quickly generate a [digital] ground elevation model (DEM), and uses an overlapping-block-utilization internal storage technique to better solve the problem of borders at the segment edges;

8. Some commonly used application tools are provided--as for example models for expert weighting, superposition categorization, and expert proposition--which allow the user to solve some particular special problems;

9. Solution of the problem of interacting calls between different languages--FORTRAN, compiled dBASE III, and 8086 assembly language--allows the system design to be flexible, and also makes full use of the microprocessor system functions.

In this day of rapid developments in computer technology, PURSIS is one of the earliest and most complete examples of GIS system software from China, and it is surely capable of fulfilling its intended role in building the national economy.

Tank Warfare Simulator Makes Its Appearance

40080123a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 2, 11 Jan 89 p 12

[Article by Shao [6730; surname only]: "A Tank-Division Assault Operations Simulation Model Passes Evaluation"]

[Text] A tank-division assault operations simulation model developed by an institute of the Armored Forces Department of the General Staff to formulate strategic development for armored troops in the year 2000 recently passed its technical evaluation.

This model is the first tank-division assault operations simulator either within or outside the military that is complete and that can be used in developmental planning for armored troops, equipment and for strategic research. It sets up a combat response system in accordance with the principles of tactical behavior with various relevant events from combat activities (including space and time) as a reference system, it implements automatic decision making, and it can quite realistically reflect the reality of the combat process.

The model uses the concepts of "coding" design and "channel" design together with technology to give an overall implementation of "integration" and "modularity." In addition, for overall control it uses input and output for each channel in accordance with coded centralizing control information, which brings great efficiency to the system. The program was designed structurally, making a system from all the routines. It strictly delineates program levels and interface relationships, and also creates monitoring points at crucial places, which provides the program with a distinct automatic monitoring function. It also conveniently connects with display software. A specifically formatted method is used for model input that complies with the practice of general military and technical personnel and with which overall planning can be realized, making both use and modification of the program convenient and flexible. Structurally, the model has a powerful capacity for expansion of functions, which makes it easy to transform it into a campaign and tactical model for researching combat principles all the way up to the level of integrated group armies.

New Public Key Encryption System Announced

40080123b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 2, 11 Jan 89 p 14

[Article by Lin Bo [2651 3134]: "PLA Institute of Communications Engineering Comes Up with RSA Public Encryption Key Cryptography"]

[Text] China's PLA Institute of Communications Engineering has used 8086 assembly language to successfully implement the well-known RSA [Rivest-Shamir-Adleman] public key cryptography system. The security of the RSA cryptographic system is based upon the breaking down of large values, and is currently commonly recognized as the public key cryptographic system with the greatest potential. The software consists of a secret decomposition algorithm, prime number testing, and encryption key generation. To ensure security, the implementation process was in accordance with relevant ISO standards, and uses "strong prime numbers" for key generation. When compared with known foreign products of a similar nature, operational speed is about the same, but the key generation method is superior. The length of the encryption key in the RSA cryptographic system can be adjusted in accordance with need, but at present uses 115-place decimal values (the current capacity for large-number decomposition is such that it would take the Cray X/MP supercomputer one day's working time to decompose one 80-place decimal value). Operating on an IBM PC/AT with a clock speed of 6 MHz, it takes 3 seconds for decryption, which should satisfy the demands of general digital signatures and interactive key matching. This cryptographic system is currently being used in two simulation systems: for "coordinate stereoscopic discrimination" and for "secure partner recognition."

Military Software Tool Written in Ada

40080123c Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 25 Jan 89 p 1

[Article by Shun [7311]: "The PADA Software Development Tool Hits the Market"]

[Text] The "PADA System Software Development Tool" passed its evaluation at the end of 1988. It was developed by Institute 204 of the Second Academy of the Ministry of Aeronautics & Astronautics Industry.

The PADA system is part of the general military software projects in the Seventh 5-Year Plan as determined by the Commission of Science, Technology, and Industry for National Defense. The attempt was to improve the PAD (Problem Analysis Diagram) into a descriptive tool and to constitute a software tool system that can support the Ada language. The PADA system developed by this institute has such functions as graphics library management, PAD graphics editing, PAD graphical conversion, and error diagnosis, as well as the printing out of PAD diagrams; it therefore constitutes a complete system. The experts judged that PADA has made an improvement in PAD methods as far as Ada programming is concerned, as it uses a primary/secondary diagramming structure to support top-down successively refined design methods. it also skillfully uses a compiler system to diagnose erroneous diagram elements, which greatly improves system functions and usability, and allows it to become a domestically produced specials software development too, as well as to attain an advanced domestic level.

The PADA system is one of the earliest domestic software systems to have been written in the Ada language, and its successful development promotes the active role of the Ada language for the design of military software systems.

New Zijin Microcomputers Go Into Production

40080123e Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 25 Jan 89 p 13

[Article entitled: "Zijin IIB Microcomputer System and Zijin 386 Supermicrocomputer Go Into Production"]

[Text] The Zijin IIB microcomputer and the Zijin 386 supermicrocomputer passed their design finalization evaluations in December 1988 in Nanjing, at which time it was decided to put them into batch production. The Zijin IIB microcomputer system independently developed by the Zijin Information Industry Company, was an S&T key project in the state's Seventh 5-Year Plan. The Zijin IIB is compatible with the internationally popular Apple IIe, but has more expansion functions, and can contend with similar foreign products.

Development of the Zijin IIB took into account the experiences in developing the Zijin II and IIA models; it was based within China, making full use and taking advantage of existing technology and equipment, as the focus was on keeping pace with domestic capacity. For that reason, a sample was able to be developed within a relatively short time, which then went into trial production. Each function is more advanced than those of the models II and IIA. The IIB has a high performance to cost ratio, and is highly reliable.

The Zijin 386 supermicrocomputer system is a high-level microcomputer developed after the Zijin AT. It uses the Intel 80386 32-bit microprocessor, with the IBM PC/AT bus as the system bus. It has attained high system performance, good compatibility with the PC series, and a high performance to cost ratio. The Zijin 386 follows trends in microcomputer development both domestically and abroad and has followed changes in the market. Within a short time this has resulted in a multi-user high-level microcomputer system that satisfies the needs of the majority of domestic users, especially the needs of the Industrial and Commercial Bank of China, of the multi-user banking profession, and of data processing. This system is innovative in various aspects of component selection, with a higher percentage of Chinese-made components and a higher domestic production capacity for the entire system, as well

as with new Chinese-character system software. After its successful development, the system underwent small-batch trial production, after which more than a hundred units were sold on trial in 1988, from which user response was excellent. Operating speed of the Zijin 386 supermicrocomputer system is twice that of the PC AT (at 8 MHz), internal accessing speed is 15-1.9 times that of the PC AT, its single user performance is equal to that of the Compaq 386, and when running XENIX, the host system surpasses the VAX 11/780 and Chaparral 6802 multi-user systems. With the constant improvements in microcomputer operating speed, RAM capacity, peripherals, and multi-user functionality, the Zijin 386 supermicrocomputer now possesses the processing capabilities of general minicomputers.

Digital Signal Processing System Announced

40080123f Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 25 Jan 89 p 14

[Article entitled: "The Super-Fast IMSA 100 Development/Real-Time Signal Processing System `ATD-A100'"]

[Text] On the basis of its work in building the ATD-320 series of development applications for 32-bit signal processing, the Beijing Zhongruan Computer Institute did detailed research on the well-known British INMOS Company's super-high-speed signal processing chip, the IMSA 100, that had been introduced in 1987 with the newest pulse array structure. From that, they recently succeeded in developing the first domestically produced IMSA-100[-based] development/real-time processing system meeting international standard. The system has the designation ATD-A100.

The IMSA 100 is a super-high-speed, high-precision 32-bit transverse filter that can perform 320 million multiplication and addition operations per second (320 MOPS). Because of its flexible structure, it can be used as a high-speed processing component in many digital signal processing (DSP) applications, and it is capable of high-speed DFT [discrete Fourier transforms], convolutions, and correlations, as well as being especially appropriate for use in various adaptive systems. The multi-layer IMSA 100's may be very conveniently cascaded together, thereby creating a long transverse filter without lowering the processing speed, and still continuing to preserve its high precision.

In light of the various strong points of the IMSA 100 just described, as well as its capacity for interfacing with many different processors, the Beijing Zhongruan Computer Institute developed the IMSA 100 development/real-time processing system to an advanced international standard using the TMS320C25 as the central processor.

The IMSA 100 development/real-time processing system is built from two processor boards, where the ATD-A100 is the IMSA 100 processor board in the system and where the user can choose the image model ATD-20C in the ATD-320 series of the 10 MOPS high-speed ATD-C25 system.

In the IMSA 100 development real-time processing system, the ATD-A100 is a plug-in board that is used together with the ATD-C25/ATD-20C, which together are plug-ins to the PC computer. With the support of special software, applications personnel can monitor via the PC, setting the parameters and operations results from the A100, as well as modifying the various data. The entire system is therefore a high-speed processing system (doing 1,024-point complex FFT [fast Fourier transform] in 2 ms and 128-step FIR [Finite Impulse Response] filtering at up to 10 MHz), while also being a development system for the IMSA 100. Without losing its generality, the host system can also be a development system for the TMS320C25 or the IMS320 0.

The experts judged that considerations taken with the ATD-A100 system were complete, that its working modes were flexible, that it contained various development systems within itself, and that it permitted direct connection with A/D and D/A [analog to digital and digital to analog devices]. With its TMS320C25 expansion I/O [input/output] port, it is conveniently used. Technologically speaking, the system broke through the embargo of high-speed 32-bit DSP development technology to China, and it has provided an effective domestic channel for undertaking real-time processing the the TI [Texas Instruments] Company's TMS320 series of chips. At present, the system has been the subject of attention by foreign specialty companies, and it is being prepared for sale in international markets.

The ATD-A100 is for use in such areas as: digital FIR filters; high-speed adaptive filters; correlations, convolutions, and discrete Fourier transforms; voice processing; image processing; waveform synthesis; self equalizers; echo cancellation; spread-spectrum communications; radar/sonar beam formation and scanning, and pulse compression, as well as high-speed fixed-point matrix multiplication.

Software Firms Head for Growth

40100040 Beijing CHINA DAILY in English 20 Mar 89 p 2

[Article by Xie Songxin]

[Text] China could have as many as 100 firms specializing in software development and production by 1995, according to the president of China's largest software company.

Favorable government policies will help the software industry, which started only after 1980, become an important sector in the national economy by then, Jia Yaoling, president of the State-run China Software Technical Corporation, predicted at a news conference on Saturday.

He added that these firms would have a combined production value of 1 billion yuan a year. Their exports would be worth $50 million a year by that time, compared with $5 million in recent years.

Jia's company aims to produce 50 million yuan worth of software by 1995, of which $5 million worth will be sold on the world market.

Jia said that the government is expected to take measures in the coming years to provide legal protection and preferential policies to encourage the development of the intellectual property industry.

And the country will encourage foreigners to invest in software plants in China's coastal areas.

Jia expected that decision-makers in the central government would soon promulgate the draft copyright law to protect Chinese and foreign software producers and to attract more overseas investment into the field.

However, he conceded that the software industry could experience difficulties in its development.

Software producers would have to raise their own money and cooperate with foreign counterparts. The central government, already troubled with cash shortages trying to address problems in the energy and raw materials sectors, can barely increase investment in the software industry in coming years.

At present, China has around 35,000 people involved in software development. But its software firms have trouble surviving because a software market hardly exists in China. And software is being sold very cheaply in the country.

To stimulate the software trade and the industry's development, a trade fair of software and computer equipment is being held in Beijing starting today.

Latest Developments in Computer Networks

Independently Developed Token Ring

40080122a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 2, 11 Jan 89 p 2

[Article by Zhang Gongzhong [1728 0361 1813]: "A Token-Ring Computer Network Is Now Being Produced in China"]

[Text] At the end of last year, Qinghua University unveiled the "token ring" computer network they have developed on their own. This network is capable of connecting PC/XT/ATs, the 0520 series, and their compatibles. The communications adapter used here (which includes gate-array circuitry) and the general-purpose ring network plug are both produced in China.

The "token ring" is a high-performance, high-quality local area network (LAN), the transmission efficiency of which ranks ahead of other networks, a fact that is more readily apparent in environments where a network is heavily loaded. This kind of network is not only useful for transaction processing and office automation systems, but can also be used for real-time processing and in process control environments that require priority accesses. Many workstations can be linked together over a range as far as 10 km and more. The transmission rate is 4 megabits per second. Twisted pairs can be used as the transmission medium.

This Chinese-manufactured token ring can run the currently most popular domestic and foreign microcomputer network software, the 3 plus package, for example. They have also developed priority setting routines and network test routines. Its low-level protocol meets the IEEE 802.5 standard, and it is completely compatible with the IBM token ring.

The token-ring network is an advanced product of a standard equal to that of similar foreign products of the mid-1980s. Its appearance has established the technological and material basis for future further domestic development and for full-scale dissemination and application of token rings.

Data Encryption System Introduced

40080122b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 3, 18 Jan 89 p 1

[Article by Shao [6730; surname only]: "Breakthroughs for China's Data Encryption Technology"]

[Text] The BIIC Data Encryption System, using data encryption theory and digital signature techniques of an international standard of the 1980s recently passed its technical evaluation by Institute 710 of the Ministry of Aeronautics & Astronautics Industry.

The BIIC Data Encryption System uses the perspective of systems engineering to combine data encryption, data signatures, arbitration mechanisms, and encrypted key control blocks. The system is based upon the RSA [Rivest-Shamir-Adleman] and DES [Data Encryption Standard] algorithms, creates five different encryption methods of differing degrees of encryption, and resolves the conflicts between the demand for density and for system overhead. Through its skillful algorithmic design and software coding, it has solved the dilemma of algorithm complexity and high volumes of calculation, which has led to sensitive system response.

This system has successfully implemented the novel encrypted signature nested to various levels, and it also uses the clear-text abstract generation method to generate clear-text abstracts. Software is combined with network high-level protocols, which with its modular design, allows the system to run under various configurations on PCs, B25 computers, and the Baolai [1405 0171] BNA [Burroughs Network Architecture] mainframe network. The system provides a friendly user interface, whereby the user can select single-point or broadcast-type encryption keys, and can choose to encrypt the entire text or just segments.

This achievement of scientific research is in the leading ranks of similar domestic products in its comprehensive system performance, and has great theoretical and applications significance for network communications systems dealing with electronic payment and sensitive data. Its success has attracted broad interest from many circles.

Independently Developed Packet Switching

40080122c Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 3, 18 Jan 89 p 12

[Article entitled: "PE-NET, a Chinese-Developed Experimental Packet-Switching Network"]

[Text] A packet-switching data network independently developed in China passed its technical evaluation on 27 December 1988 in Beijing.

This network equipment was successfully developed jointly by Institute 30 of the Ministry of Machine-Building & Electronics Industry, the University of Electronic Science and Technology [formerly Chengdu Institute of Telecommunications Engineering], and Fudan University.

The network equipment includes:

1. The network management and control center (NCC), Which includes:

--primary and reserve operations control stations, color graphics display, printer, and large capacity external storage:

--internally managed network-oriented level 1-5 communications protocols;

--network management data base;

--more than 60 network control commands: can handle various types of management, as for example the management and control of users, configuration, routing, flow control, logs, status, monitoring, and maintenance;

--report collection, processing and filing, to aid in handling statistics, charges, testing, status, and warnings;

--and security and protection.

2. Package switching equipment (PSE), which includes:

--local control station and external storage;

--16 X.25 access circuits;

--eight X.75 trunk lines between nodes (64 Kilobits per second operation for three lines;

--switching between two levels;

--five reserve circuits;

--user address and selection tasking;

--levels 1-5 communication protocols that are management oriented;

--node database system;

--node, board and circuit control;

--and security and protection.

3. There are three types of packet packaging/disassembling equipment (PAD-A, PAD-A2, PAD-B):

--PAD-A: includes eight asynchronous ports and one X.25 circuit;

--PAD-A2: in addition to the functions of PAD-A, also has a local switching function;

--PAD-B: includes 16 asynchronous ports, two X.25 circuits, and a local switching function;

--the three PADs all comply with CCITT X.3, X.28, and X.25 protocols, statistical multiplying is done internally, and the speed and coding of each port is selectable;

--and the three PADs have system monitoring, text supplementing, and output switching functions.

By using the equipment just described, one can set up a complete small-to-medium-scale packet-switching data network. At the same time, by using a dial-up modem and a PAD machine PE-NET can call in and out over public telephone networks on behalf of data users. At the evaluation session, a four-node PE-NET network operated normally. The testing group did full-scale testing of the network performance. In its judgment, the network is in strict compliance with relevant CCITT protocols, and it meets advanced international standards.

The high-speed 64-Kilobit-per-second channels, the X.75 standard protocol, and the network management control system and network system generation technology used by PE-NET remain technologies of restricted export to China by foreign countries.

New Server, Ethernet Workstation

40080122d Bejing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 25 Jan 89 p 1

[Article by Xie Tielu [6200 6993 6424]: "Two Major National Seventh 5-Year Plan Science and Technology Projects Pass Evaluations"]

[Text] Two major S&T projects in the state Seventh 5-Year Plan that were successfully developed by Nanfang [i.e., Southern] Information Enterprises, Ltd.--the SIEC 386 server and the SIEC-EM Ethernet workstation with 3+ network point-to-point real-time communications software--each passed design finalization and production finalization evaluations as sponsored by the Ministry of Machine-Building & Electronics Industry. The company also had its uninterrupted power supply (UPS) series of products evaluated at the same time.

The SIEC 386 server is completely compatible with the 3+ network system software supported by the 3S/200 server, and has a concurrent server operating mode. Its performance to cost ratio is greater than that of the 3S/200 server, its operating efficiency is 150 percent greater than that of the 3S/200 server, and it can also run the 3S/400 server software. This product is easy to maintain, it has stable performance, the system is reliable, and the technology is advanced.

The SIEC-EM networked workstation is capable of being directly initialized and admitted to the network in a diskless situation, and under non-networked conditions, it can run a ROM BASIC program. Its functions are completely compatible with the 3+ network system software and applications software supported by the 3Station of the [U.S. firm] 3Com Company.

The 3+ network point-to-point real-time communications software has several functions, among them broadcast communications and real-time data transmission, screen copy graphics transmission, and interactive transmission, which make it very useful. With a Netbios interface and a performance not affected by change of interface cards, this product has no precedent in China, and it has a high domestic usage value.

The UPS series of products developed by Nanfang Information Enterprises, Ltd., extend from 300 VA [volt-amperes] and 500 VA to 1,000 VA R- and S-series products. These products are notable for their high-performance noise-filtering circuits, powerful anti-interference capacities, long back-up times, and reliable cut-off. There is protection within the cabinet from overload, shorting, overheating, and loss of battery voltage, and they also have automatic charging and automatic voltage regulation functions. This series of products meets standards of similar imported products, and the 500 VA power supply in particular was the first Chinese product to pass the highest international standard--the FCC Class B.

Aerospace Ministry Office System

40080122e Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 25 Jan 89 p 15

[Article by Shao [6730; surname only]: "Network System for Aerospace Ministry Affiliates Passes Technical Evaluation"]

[Text] The "Aerospace Ministry affiliates' network system" that passed its technical evaluation at the beginning of the year in Beijing is a computer LAN system based on the PABX, and it supports various configurations such as independent workstations, clustered workstations, and B-NET networks, as well as one by which it becomes a sub-network in the Aerospace Ministry's wide-area network through the PABX. Within this LAN there are graphics and large-screen displays, as well as a project dispatched telephone system and an independently developed a P1351 printer speed-up card, which brings about a ten-fold improvement to the speed of Chinese-English printing. Through applications development, they have effected point-to-point information transmission and distributed processing, electronic mail can be interactively disseminated, and there can be sharing of intra-network and Aerospace-system large-network resources, which solves problems with the direct transmission of data and electronic mail between Ministry affiliates and the base-level units. As a means of environmental support, it has made a contribution to aerospace information systems engineering. For the past two years, this system has run normally, which shows that the system design is rational, safe, and reliable.

This system developed by Institute 710 has been in use for some time within various domestic ministry commissions, provincial and municipal organizations, and the Ministry itself, and it has taken a leading position domestically for its unified network structure design, as well as for the network systems of Ministry affiliates and for information systems throughout the entire industrial sector.

Sinicized DEC LAN, Other New Products

40080122f Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 25 Jan 89 p 15

[Article entitled: "New Achievements in Technology Developments Exhibited at Yuanwang Building"]

[Text] A new technologies exhibit opened on 5 January in the Guesthouse of the Yuanwang Building in the Taiping District of Beijing. This exhibit, run by the newly founded Beijing Yuanwang New Technology Development Company, concentrates on some new achievements recently made in the area of computer applications. Among them are: (1) a software associative BC Chinese-character processing system, (2) A Chinese-character DEC local area network (LAN) and (3) a 50-character per unit Chinese-character-input method.

The BC Chinese-character processing system adds a flexible associative editing function to the original edition, which is particularly appropriate for text editing, and that provides the user with a good helper that is inexpensive and intuitive. The BC software also includes table generating routines, table delineation through keyboard input, thick or thin lines at will, expansion or reduction of forms on demand, and a printing speed that is in the forefront of tis kind. In recent years, use of the BC software has spread rapidly, bringing excellent social and economic results, and receiving a good evaluation from users in the offices of the central authorities.

The Chinese character DEC LAN has discarded the limited thinking of centralized service; each terminal is now allowed to become a workstation. Many functions are included, such as point-to-point communications and broadcasting. This network is easily expanded to become a DEC wide-area network, hardware is easily connected, the software is complete, and it is reasonably priced. In recent years, this network has been used in large-scale testing within the Commission of Science, Technology, and Industry for National Defense system and for the management of daily tasking. Results have been excellent.

The 50-character-per-unit Chinese-character-input method is an invention of Assistant Professor Zhang Guofang [1728 0948 7089] of the Chengde Academy of Medicine. The method has been further improved by this company, making it even more mature. There are few character components in this system, few keys are used for input, and there is a low rate of duplicate coding.

For the most part, it uses the key for the first letter of a syllable and the key for the first letter of the next character to enter Chinese characters, so that anyone who can read and write Chinese can enter characters easily. Professor Zhang has also compiled a Chinese dictionary that uses the 50-character-per-unit method to look up characters, so that anyone who can look up characters in a dictionary is able to enter Chinese characters with a computer. For this reason, this method will have very good social results.

Military Command Software

40080136a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 5, 1 Feb 89 p 1

[Summary] A certain automation research station in the Xinjiang Military Region has recently developed two software systems for military command. The "Motorized Infantry Division Offensive/Defensive Tactical Organization System Software" [mo bu shi gong fang zhandou zuzhi jieduan xitong ruanjian] has proven effective in field trials and was awarded an Army prize for advanced scientific achievement, and the "Tianshan 1 Combat Command Decision-Making System" [see JPRS-CST-89-005, 23 Feb 89, pp 64-70] (recently certified) fills a domestic void in battlefield-command military expert systems.

Military Management Information System

40080136b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 5, 1 Feb 89 p 14

[Summary] The "Logistics Department Command Management Information System" (FB-CMIS) jointly developed by the Hu Dong [Shanghai East] Shipyard and a certain branch of the Nanjing Military Area Logistics Department recently passed acceptance check at Wuxi [Jiangsu Province]. FB-CMIS will provide China's military logistical personnel with a means for improving efficiency by 500 to 1000 percent and more--statistical reports that used to take a month can now be completed in a day or so, and clothing distribution and accounting reports that originally required 3 months work can now be finished in 2 weeks.

Export of Convex C-1 Minisupercomputers to PRC

40080136c Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 6, 8 Feb 89 p 2

[Excerpt] The U.S. firm Convex Computer Company and its Hong Kong agent, the Geotech Corporation, held a meeting in Beijing a few days ago to report on latest developments regarding export of [Convex's] minisupercomputers to China. Convex began planning for export of its C-1 [minisuper]computer to China 3 years ago, signed a contract for export of the first C-1 to China's Institute of Atmospheric [Physics under the Chinese Academy of Sciences] in 1987, and [presided over] installation and acceptance check in January 1988. Original plans called for export of 10 C-1's to China in 1988, but since two other American firms engaged in export of computers to China raised questions on the matter with the U.S. government, the U.S. government informed the Convex Company that the latter's export license for C-1's to China was suspended, pending a new investigation. After negotiations between the Chinese and American governments and inter-company efforts, export of the Convex C-1 computer to China again received the U.S. government's approval. Convex states that the C-1 vector computer can be exported to China, but three basic conditions must be considered: technical indicators [zhibiao], the end user, and the end use. [Passage omitted] [See also JPRS-CST-88-015, 12 Aug 88, p 54, on export of a Convex C-120 minisupercomputer to China].

Strategic Issues in the Development of Geological S&T

40080080 Beijing ZHONGGUO DIZHI [CHINA GEOLOGY] in Chinese No 11, Nov 88 pp 9-10

[Article by Zhang Bingxi [1728 3521 3588] of the Scientific Advisory Commission, Ministry of Geology and Mineral Resources: "Some Strategic Issues in the Development of Geological S&T"]

[Text] During the Sixth 5-Year Plan, the completion of attacks on key S&T problems in the areas of geology and resources organized by the Science Commission, Economic Commission, and other related departments produced substantial progress in geological S&T in China. At the same time, rich experience was gained in organizing integrated multidisciplinary and multi-industry attacks in the three fields of surveying--scientific research--education. The Ministry of Geology and Mineral Resources and the China Geology Society convened Sixth 5-Year Plan key geological task project achievement exchange conferences in the Ministry of Geology and Mineral Resources and in relevant departments throughout China at the end of 1986. These two conferences organized experts participating in the meetings to discuss the main achievements in each primary discipline during the Sixth 5-Year Plan and opinions on future development of geological S&T to provide important references for future arrangement of geological S&T work and formulation of development plans (see ZHONGGUO DIZHI No 5, 1987 and ZHONGGUO DIZHI XUEHUI HUIXUN [Report on Meetings of the China Geology Society] No 32, January 1981).

Now I will use this data as a foundation to offer some views on development strategies.

I. Orient Toward the Need To Develop the National Economy, Actively Foster the Role of Geological S&T

Geological work now provides growing services to national economic construction and development. Geological work is needed in many areas in our efforts to develop agricultural production and reinforce basic industries and to construct basic facilities to assure sustained, stable growth of the national economy. Examples include rational utilization of water, fertilizer, and resources in agriculture; energy resourcesand mineral resources needed for basic industry; engineering geology conditions needed to build communication and transportation facilities, coastal harbors, and so on. In

addition, there is the important geological work required for urban construction, environmental protection, disaster prevention, and other areas. Thus, the "orientation" of geological S&T is wide-ranging and there is an ever-increasing number of activities which "rely" on geological S&T. This is particularly true of the need to begin with management of geological activities in future reforms, where considerations of geological work and even of geological S&T development programs should actively use short-term and medium-term demands for geological work in all areas when considering development programs and concrete plans for geological S&T.

II. The Demand for Geological Work During the Process of National Economic Development Is Not Limited To "Preparatory Period" and "Leading Period" Stages

In the past, emphasis was placed on the "preparatory period" and "leading period" nature of geological work in national economic construction, but this was only one part of a whole industry. Mining geology and oilfield geology work are involved from beginning to end in mine and oilfield construction and production. Environmental protection during the open-pit extraction process and environmental control and restoration after extraction also require geological work. Maintenance and disaster prevention for major construction projects after they go into operation, including railroads, highways, shipping channels, reservoir slope landslips, harbors, and flood prevention and dredging on rivers all require regular geological observations and monitoring, and post-disaster control work. These examples show that geological work is absolutely not limited to the "preparatory period" and "leading period" stages of construction. Of course, "preparatory period" and "leading period" geological work is of fundamental significance in geological work, but we cannot ignore subsequent geological work. Thus, a comprehensive consideration of the development of geological S&T cannot be limited to the need for geological S&T during the "preparatory period" and "leading period."

III. A Thorough Understanding of Geological Conditions Is the Basis for Solving Related Real Questions

To deal better with actual geological questions, a thorough understanding of basic geological conditions in a relevant region or zone is essential. In a single region, there are many real questions which must be solved, such as underground resources, engineering geology conditions, environmental geology, and even tourism resources, and other areas. In the final analysis, however, the solution of problems depends entirely on an understanding of the basic geological conditions of the region or zone. This is particularly true following the development of economic construction, which will lead to fewer and fewer easily found minerals and optimum sites for facilities. Discovering minerals and solving engineering geology questions will require that channels be opened to ever more concealed and complex goals. As forces of production develop, man-made factors will have ever-increasing effects on the role of natural geology and the degree will increase as well. Situations which have not occurred in the past will continually appear. This means an inevitable increase in the depth of basic geological research,

the comprehensive nature of dealing with problems in many areas, and high demands for the corresponding technologies and facilities. Choosing the corresponding topics and key scientific and technical problems which must be overcome from a large number of real questions will become an important part of formulating good S&T development plans.

IV. Reinforce Summary and Synthetic Research On the Basis of Existing Achievements, Improve Understandings of Regional Geological Conditions

Since the founding of the nation, many departments throughout China have done a great deal of geological work in regional geology, geophysics, geochemistry, underground resources (energy resources, minerals, underground water), engineering geology, disaster geology, the corresponding basic scientific research, and other areas. They have accumulated much data and experience, and they have large numbers of personnel who have worked for many years and are familiar with geological and resource conditions in specific regions (most now have returned to the second line). In addition, they have a rather comprehensive foundation and potential in the areas of developing technical methods and in instrument and equipment design and manufacture. However, because of departmental separation and the singularity of work in the past, they have been unable to make comprehensive and synthetic summarizations based on this large amount of data, experience, and talented personnel to improve their understanding of basic geological conditions and study successful experiences as well as inadequacies between these achievements, and to understand and solve real problems to be able to begin with an understanding of a region's basic geological conditions for comprehensive consideration and evaluation of all types of geological resources and attain a corresponding improvement in theoretical understandings, or to suggest main problems which exist and directions for future efforts. These questions should be one measure of beginning with real conditions for comprehensive consideration of the direction of future efforts. Comprehensive research and evaluation of these geological resources and the environment should be conscientiously organized and continue to proceed forward.

V. Geological S&T Development Strategies Should Serve Strategic Ideologies and Deployments for Development of the Whole Economy

Clear strategic goals, focuses, and measures for S&T development are requirements for S&T development programs proposed by Premier Li Peng in his ZHENGFU GONGZUO BAOGAO [Political Work Report]. Beginning with "orientation," geological S&T work development strategies should serve strategic ideologies and deployments for development of economic construction as a whole. In combination with preceding section III and based on the characteristics of geological work, we fully have the conditions to choose the relevant key basic research and applied research on geological questions related to key aspects of national economic development to make arrangements for key topical projects.

VI. Begin With Concrete Conditions and Interrelationships of Coastal and Interior Areas, Integrate with Development Prospects, Arrange Regional Geological S&T Work

A strategy for accelerating economic development in coastal regions based on the regional characteristics of geological work, geological conditions, and resource situations and prospects which is integrated with the current situation and prospects of base area construction and economic development requires that we make regions the units for comprehensive consideration of real conditions in each region in considering strategic regional goals, arranging S&T projects, and organizing attacks on key problems. In conjunction with the regional "comprehensive research on geological resources and the environment" work mentioned in section IV above, we can use the basis of strategic ideologies and deployments for developing the entire economy in each region to determine key projects in geological S&T and arrange work to deal with the most urgent questions first.

VII. We Must Develop Advanced Technologies and Penetrating Disciplines in Work To Attack Key S&T Problems

Divide research topics into subtopics and organize forces for attacks on key problems based on key geological and technical issues. When organizing implementation, we can use the spirit of S&T system reforms to break down department boundaries, solicit and submit bids or contractual responsibility on a national scale, select optimum organizations, reinforce network management, and pay attention to absorbing new foreign S&T achievements and using them for our own purposes in our work to develop advanced S&T and penetrating disciplines in China.

VIII. Apply the Ideas and Methods of Systems Theory and Systems Engineering To Organize Geological Work and Geological S&T Development Throughout China

Because of the complexity of the tasks concerning and facing geological work and geological S&T work, the multitude of types of work and disciplines involved, and organizational divisions, we must have the perspective that all activities involved in planning, organization, and management of the entirety of geological S&T work involve large scale systems engineering, and we should use scientific research and considerations to exploit more potential and take more steps to effectively derive maximum socioeconomic benefits. Work in geological activities as a whole especially involves large scale systems engineering. From the perspective of long term goals, we also must quickly apply the methods of systems engineering to consider relevant key questions.

The issues outlined above are quite immature and should serve only as a modest spur to induce something far better to come forward, and I hope they will be criticized and corrected.

3-Dimensional Programming System for Machine Tools

40080110b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese
No 49, 21 Dec 88 p 13

[Article by Xuan [surname only: 1357]: "Multi-Functional Three-Dimensional Numerically Controlled Automatically-Programmed Applications Software Comes into Existence in Beijing"]

[Text] The first multi-function three-dimensional numerically controlled automatically-programmed applications software (NC3APS-M) in China passed its evaluation in Beijing recently. This system was developed jointly by Department 7 of the Beijing Aerospace University and by the Dongfang Science and Technology Company, Ltd. (Beijing).

This system uses the type-B spline camber and segmentation intersection algorithm as its basic numerical model, and its automatic programming process in menu-driven with interactive graphics. It is highly efficient and convenient to program. Because the system has such automatically completed functions as free camber intersection and transition surface processing, as well as rough and fine processing, it offers a powerful means for machining components with complex curved surfaces (including intersecting camber transition surfaces and bounded curved surfaces) and for numerically controlled, automatically programmed die processing. Because of its small cost, this system has great application and dissemination value.

The system was updated and improved on several occasions on the basis of test processing. It is currently installed at the Beijing Machine Tools Institute, the Harbin Dong'an Machinery Plant, Shenyang Plant #724, and the Chengdu Hongguang Kinescope Plant where it is used for machining such components as television housing molds, blade dies, rubber tire molds, and kinescope molds, respectively. Processing precision can reach $\pm$ 0.0025 mm, which is a great improvement in processing quality and production efficiency.

This system is used primarily on 286-class microcomputers or on the GW0520CH host, and it can also drive various common models of plotters and paper-tape punches. The system was written in PASCAL, and the

graphics software uses an assembler. The experts judged that this system meets standards for similar international products of the 1980s, and that some features exceed those of foreign programming systems (as for example the Japanese FANUCDIDII). Its appearance will have an effect on the development and production of domestic CAD/CAM software, and at the same time will also create new opportunities for commercialization of products from research at institutions of higher learning.

Latest Developments in CNC Machine Tools, Flexible Manufacturing Technologies Surveyed

Hopes for Domestic Production

40080047a Beijing JICHUANG [MACHINE TOOLS] in Chinese No 4, 1988 p 3

[Article: "Great Prospects for Domestic Production of NC Tools"]

[Text] The small-scale Internal Exhibit of Latest Results of the Beijing Area in Domestic Production of Numerical Control Systems was held in the Beilou Large Conference Hall of the State Machine-Building Commission on 16 January [1988]. Commission vice chairmen He Guangyuan [0149 0342 6678], Tang Zhongwen [0781 0112 2429] and Li Shouren [2621 1343 0177] and the heads of relevant departments and bureaus attended. Three newly developed, domestically produced low- and medium-level numerical control [NC] systems were displayed.

The MNC 864 closed-cycle NC system, developed in lessthan a year by Institute No 706 of the Ministry of Astronautics Industry, can control four-axis or tandem-drive three-axis milling machines and machining centers. This system makes use of easily assimilated circuitry of imported NC technology and incorporates functional module boards and general purpose chips. The institute has developed a system architecture and software suited to Chinese conditions. The use of isolation and anti-interference measures has made it possible for all of the printed circuit boards to be two-layered. The board interconnection method is being made more rational and is readily maintainable. Interactive programming is based on Chinese-character menus and is very convenient for the user. In developing the NC system, the institute followed aviation industry component screening and routine testing standards, resulting in a rather rigorous quality control system. More than 80 percent of the system components are already domestically produced.

The BS 04 NC system developed by the Beijing Machine Tools Research Institute can be used in lathes, boring and grinding machines and economical machining centers and can control a total of three spindles or two spindles simultaneously. The system makes use of the 8086 series of microprocessor chips. The use of special-purpose chips increases system reliability and operating speed. The CNC [computer numerical control] hardware

configuration, with hardwired software, uses both separate and standardized types, which are user-selectable. The main system components are mounted in a compact arrangement on a 6-level motherboard. The system has considerable functional expansion potential and good noise immunity, and 78.6 percent of its components are domestically produced.

The lathe NC system based on the STD bus that was developed by the electronics plant of Beijing Industrial University attracted great interest. It is a full-featured low-level NC system with a Chinese-character CRT display and an on-line programming capability. By using general-purpose function boards based on the imported STD industrial controller bus, which is produced by the PRO-LOG Company (U.S.), the plant was able to construct a variety of NC systems for use with machine tools. Its methods embody the new trend in China's machine-tool industry toward development of low- and middle-level NC technology. NC systems based on the STD allow expansion of the product assortment and expansion of capabilities. Because most STD-based function boards can be batch-produced by designated domestic organizations, this creates conditions favorable to the industry's use of modular boards to create a variety of NC systems.

The products at the exposition represented a small fraction of the significant research results that have been developed in the course of China's independent development of NC systems. In organizing these key-problem efforts, the Machine-Tools Office ofthe Machine-Building Commission thoroughly mobilized various strong points of our society, broke through the barriers between industries, made use of the competitive mechanism, took advantage of the technology and equipment advantages of the military-industrial departments and the research and development manpower of advanced academies and schools, and motivated departmental collectives and enterprise groups to assimilate imported technology and rapidly derive new NC system varieties. As soon as these products complete production tests and are certified, they will be put on the market.

New Advances in Technology

40080047b Beijing JICHUANG [MACHINE TOOLS] in Chinese No 7, 1988 pp 4-9

[Article by Zhang Kechang [1728 0344 2490], Chairman of Machine-Tool Evaluation Committee for second "Spring Swallow" awards: "Current Technological Advances by China's Machine-Tool Industry"]

[Text] More than a thousand machine tools in 10 major categories were displayed at the First Machine-Tools and Tooling Exhibition, held at the Agricultural Exhibition Hall on 12-22 March [1988]; their scale and sophistication were unprecedented in China. They gave a rather complete indication of the industry's recent technical progress and reflected achievements in implementing the modernization and open-door policies. "Spring Swallow" prize evaluation of the superior products on display indicated certain features of technical progress in China's machine-tools industry.

I. The Policy of Opening Up Has Accelerated Technical Progress

There have been two periods of large-scale technology importation in the recent history of machine-tool development in China. The first took place during the First 5-Year Plan, when a group of machine-tool plants were built or rebuilt with Soviet help. At the time, there were 18 machine-tool plants, which were called the "Eighteen Arhats." After 30 years of ups and downs, they still constitute the industry's mainstay enterprises. Many machine tool, cutting tool, measuring tool, measuring instrument, attachment and accessory plants on various scales have developed around these mainstay plants. The new stage of China's economic development (1978-1987), has brought about a second large-scale importation of technology. Several machine-tool plants have cooperated with well-known plants in Japan, England, France, the United States, Italy and the FRG in producing a variety of advanced products. As a rule, these products were developed in the 1970's or early 1980's and were rather competitive on the international market. Cooperative production accelerated the technical development of the enterprises. Let us consider several examples.

(A.) A few years ago, the Jinan No 1 Machine-Tool Plant imported MAZAK lathes produced by the Yamazaki Ironworks in Japan, which stimulated plant modernization. These products have been in lot production for many years and have sold well both in this country and abroad. More recently, the MAZAK QT10 NC lathe (second prize)* was imported, and in 1984 this machine tool was exhibited at an international machine-tool exhibition in Tokyo. It features interactive programming and automatic tool insertion, and tip wear and breakage monitoring capabilities. It has automatic feed and robotized workpiece loading and removal capabilities, so that it actually constitutes a flexible machining cell (FMC) for lathe work, which can be incorporated into a flexible manufacturing system (FMS). Technology importation promoted the conversion of the plant's products to numerical control. Recently, the plant also cooperated with the Steinel company in West Germany in producing a new product, the J_1-BZ20 small machining center, which is at the 1980's state-of-the-art. Making use of imported technology, the plant rapidly strengthened its ability to adapt to market changes and to develop new products.

(B.) The Nanjing Machine Tool Plant imported the Traub company's (FRG) TND 360 NC lathe, and subsequently the TNS 42/60 NC automatic lathe (second prize). The TND 360 received a first prize at the first Spring Swallow evaluation and is now in batch production and is being resold on international markets. The TNS 42/60 is the newest imported product; it has broad process adaptability and is suited to machining of disk-shaped workpieces and long or short bar stock. The cutter adjustment system is accurate and convenient to operate; the 12-position tool holder can hold six cutting tools; if combined with a 72-equivalent-position main spindle, it can perform axial or radial drilling, milling and tapping. It also has

*Here and below, the prizes awarded in the second Spring Swallow evaluation are given in parentheses.

automatic feed for bar stock, measurement devices, and a variety of selectable cutting tools, increasing the degree of automation of the machine. Its NC system has a dynamic graphic analog display system (GPS), which can display the processing program or check it for correctness.

(C.) A few years ago, the Shenyang No 1 Machine Tools Plant cooperated with the University of Aachen (FRG) in implementing computer assisted production planning, which became a model for the modernization of production management in the industry. As regards products, the plant recently cooperated with the Heinemann company (FRG) in designing and producing the MOC 200MS3 lathe-work FMC (first prize), which has a diameter spec of 615 by 1750 mm. This device has an automatic tool-change and an automatic workpiece-handling robot, automatic blade adjustment and compensation, automatic workpiece measurement and tool breakage or wear detection. The tool magazine has a capacity of 60 tools. The main spindle has a C axis indexing accuracy of 0.01°. The movement of the tailstock and center rest can be controlled by a CNC system, and the center rest can be synchronized with the tool rest as a follower rest. The movable tool rest, with 12 blade positions, can hold six cutting tools and can perform milling, boring and tapping perpendicular to the main axis and horizontally. Its machining accuracy is class IT6, with a surface roughness Ra 0.8 μm and a roundness of 3 μm. It is equipped with an automatic chip removal device. This machine tool is at the international state of the art; importing it would cost about a million U.S. dollars, and its development will both save foreign exchange and earn foreign exchange for the country.

(D.) The Chinese-Czechoslovak Friendship Plant has been producing horizontal boring machines, jig boring machines and machining centers for many years; it recently imported a new 1980's-level product from the Scharmann company (FRG), the Solon 3-1 large horizontal machining center (first prize). The work table measures 1000 x 1000 mm. The three-coordinate positioning error is 0.015 mm, and the B-coordinate 4 x 90° positioning device uses inductive sensor positioning, with a 90° positioning error of ±2". The machine tool has two interchangeable work tables and uses Reinishaw probe automatic workpiece measurement and automatic workpiece positioning compensation. The measurement repeatability is 0.5 μm. It has tool life monitoring and tool length/breakage monitoring and is equipped with an automatic chip remover and a fully closed working space. It is suited for multisurface milling, drilling, boring and tapping, and for combined processes on three-dimensional curved surfaces; it is a modern piece of equipment for flexible machining.

(E.) The Beijing No 1 Machine Tool Plant has abundant experience in producing milling machines, large contour milling machines and machining centers. Since 1984 it has imported production technology from the Waldrich-Coburg company (FRG) and has engaged in cooperative production of the FP 500 NC double-worktable 5 x 17 meter superheavy NC milling planer and a milling-planer machining center with a work-table width of 1.75 meters and an [automatic] tool-magazine capacity (ATC) of 60 tools. Recently, it has cooperated with the Senberg company (U.S.) in producing the MCP 800 large-size moving-column NC contour-milling machine (first prize)

with machined surface dimensions of 800 x 2500 mm, a maximum load capacity of 6 tons, a main axle speed of 40-9000 RPM, a positioning accuracy of ±0.01/300 mm and a repeatability of 0.03 mm. Itis suited for machining various high-accuracy, complex dies. The machine tool makes use of the Italian Fidia Compact 12 NC system and the Ranbaudi milling head, the U.S. company Gettys's profiling head and DC servomotor, a Heidenhain [FRG] optical-grating-system four-spindle tandem-drive closed-cycle NC system. It has a shape-digitization capability, three-dimensional tool radius adjustment, and a variable-pantograph proportionality coefficient, in addition to three-dimensional coordinate measurement (accuracy to 0.01 mm). Last year [1987], it won a high rating at the third U.S. Machine Tools Fair in Shanghai, as it did at the present exhibition. Six units have already been produced; one has been sold domestically, and the rest have been sold in North America.

(F.) The Hanchuan Machine Tool Plant imported from Japan technology for manufacturing the [Japanese] Sodick Company's A3C ATC precision electro-spark machining center (second prize), using the Mark-II CNC system; it is also equipped with a high-efficiency wear-free pulsed-power supply and superfinish machining power supply. It can store electrical and machining specifications, and it has an 8-unit automated electrode changing device. It has a maximum productivity of 3.8 grams per minute, a coordinate positioning accuracy of 0.015 mm, and a tool change positioning accuracy of 6 μm. The machined surface roughness can reach Ra 0.4 μm. Importing and producing this variety strengthened the plant's ability to adapt to market requirements.

(G.) The Nanjing No 2 Machine Tool Plant chiefly produces gear-machining tools. It recently cooperated with the SHW company (FRG) in producing the UF-41 NC universal-tool milling machine (second prize), which in 1984 won a gold medal at the Leipzig international exposition. The work table measures 1100 x 840 mm, with a maximum load capacity of 800 kg. It uses the Heidenhain (FRG) TNC 150B numerical control system for four-spindle closed-cycle contour control and has a rapid changeover horizontal- and vertical-milling main spindle and a high-accuracy rotating work table. With one loading of the workpiece it can perform five-surface machining and machining of a variety of complex surfaces as well as milling, drilling, tapping and boring. It is suitable for housings and enclosures, plate and bar stock, and die machining.

In addition, the Changzhou Machine Tool Plant cooperated with the STAMA company (FRG) in producing the MC 118 vertical machining center (third prize); the Dalian No 2 Machine Tool Plant cooperated with the Boehringer company (FRG) in series production of the DUF 701 x 2000 precision lathe; and the Dahe Machine Tool Plant imported Italian honing machine production technology. Cooperating with well-known foreign companies in producing advanced technology products has had a positive effect, increasing these plants' ability to develop new products and promoting technical progress.

II. Assimilating New Foreign Technologies for Chinese Use

Numerical control is a new technology that developed in the 1950's. Its extensive adoption produced a breakthrough in machine-tool design and production and it became the mainstream of technical progress in machine-tool production. China's machine-tool industry began experimental studies on NC technology in the late 1950's, but historical factors made progress slow. The situation was not rectified until the early 1980's when the (Japanese) FANUC company's NC technology--including the CNC 5, 7, 3 and 6 systems and servomotors with their control equipment--was imported and put into batch production. At the same time, many advanced academies and schools, research organizations and plants in China made major research and development efforts in NC technology, achieving gratifying progress. For example, the Shanghai Machine-Tool Research Institute imported the (U.S.) GE company's NC system and assimilated it into Chinese production, developing the MTC-1 NC system which could use a Chinese-character display (first prize). In addition, the Liaoning Precision Instrument Plant in Shenyang imported the U.S. Dynapath 10 NC system, implemented a Chinese-character CRT display and mastered domestic production of the system as the model LID-10 (second prize). Research Institute No 706 of the Ministry of Astronautics Industry developed the MNC 864 numerical-control drilling and milling machine (second prize). The electronics plant of Beijing Industrial University developed an STD-bus-based modular NC system. The Beijing Mac-ine Tool Research Institute independently developed the BS04 universal NC system (first prize) and the BS03B economical NC system (third prize). These NC systems were gradually adopted by numerous machine-tool plants. Many of the electrical machining tools shown at the present expedition incorporated numerical control.

Starting in the 1980's, by assimilating foreign technology, [Chinese] machine-tool plants developed many NC machine tools. Many new machining centers appeared in 1981; FMC's and universal NC machine tools appeared in 1984, went into batch production and were adopted by users. Of the 211 machine tools at the exhibition, 52.1 percent were numerically controlled. While a few of them were the result of cooperative production, the great majority were new products independently developed by machine-tool plants. They represented a variety of technical capabilities and price levels and were suited to a variety of uses. They included sophisticated machining centers, FMC's, lathe-work machining centers, multipurpose NC lathes and the like, and a variety of inexpensive economical NC machine tools. A sophisticated device such as the Dalian Modular Machine-Tool Research Institute's three-coordinate FMC (first prize) has software and hardware to expand it into an FMS. Other sophisticated products include: the Wuhan Heavy Machine-Tool Plants XK2116 NC milling planer and boring machine (first prize) and its CH5116 single-column vertical lathe-work center (second prize); the Qiqihar No 1 Machine-Tool Plant's CHK 5120 vertical lathe-work center (second prize); the Shanghai No 2 Machine-Tool Plant's CHK 6463 horizontal lathe-work center (first prize); the Beijing Machine-Tool Research Institute's and Beijing No 1 Machine-Tool Plant's vertical machining centers of various sizes; the Shanghai No 4 Machine-Tool Plant's and Dahe Machine Tool Plant's XH764 and TH6350 horizontal machining centers

(second prize); the Great Wall Machine-Tool Plant's lathe-work FMC and CKS 7832 four-axis NC lathe (second prize); and the Suzhou Electrical Machining Research Institute's DK7632 NC low-speed threat-cutting machine (first prize). These are already on a par with the corresponding foreign products.

In addition to the above NC machine tools, in recent years various plants have assimilated foreign products and new technologies to develop a variety of high-level new products suited to various user requirements. New equipment for the automotive industry includes: the CS-5018 vertical interior broaching machine (second prize) developed by the Changsha Machine-Tool Plant for the First Automotive Plant, of which a total of 15 units have been produced, and one of which was on display at the exposition; the YA9320 automatic gear-chamfering machine (second prize), which can chamfer a single gear tooth in 0.2 seconds, and the YBJ5612 variable-speed-ratio sector gear cutter (second prize), both produced by the Tianjin No 1 Machine-Tool Plant. In order to enable a tool plant to produce ground drill bits, the Wuhan Machine Tool Plant developed three companion machine tools, the MZE 9313 fully automatic drill-bit land grinding machine, the MZD 9313 fully automatic drill-bit flute grinding machine, and the MZ6313 fully automatic drill-bit tip grinding machine (second prize). In addition, the Shanghai Heavy Machine Tool Plant developed the MM52 100 planer-type slideway grinding machine with a concave and convex grinding capability (first prize) to support technical modernization of the machine-tool industry. These products not only are capable of raising the manufacturing process standards of their users, but also can save large amounts of foreign exchange for the country and replace imported products.

III. Accumulate Our Own Experience and Create Innovations

China's machine-tool industry, which includes numerous machine-tool plants, research organizations and relevant specialties and departments of advanced academies and schools, has accumulated more than 30 years of experience, has strong technical capabilities and manufacturing bases, and has become an important force promoting technical progress in machine-tool product research and development, design and production. Not only can it rapidly master imported technologies and then proceed to develop new, modern products, but it also can accumulate its own rich positive and negative experience in order to create innovations. It has had successful experience in promoting technological progress. For example, when cut off from the rest of the world, it successfully developed highly accurate precision machine tools that were urgently needed by the country, and provided sets of automatic machine tools, modular machine tools, and automated production lines for the automotive industry and axle-bearing industry. In addition, it learned lessons from failure; it took a tortuous path, and it was only from 1978 on that it gradually awoke. For several years, numerous machine-tool plants have made use of their own technological experience and special strengths and have developed many new progressive products, displaying technological advances, which have won a reputation in domestic and foreign markets. They include the Shanghai Machine-Tool

Plant's MGA 1432B high-precision cylindrical grinding machine (first prize), whose machining accuracy is 0.1 μm in roundness and 0.8 μm in longitudinal profile, Ra 0.008 μm surface roughness; the Beijing No 2 Machine-Tool Plant's MGK 1320A NC high-precision cylindrical grinding machine (second prize); the Beijing No 1 Machine-Tool Plant's XA 6132 universal column-and-knee-type milling machine (which ultimately modernized an older product); the Hanchuan Machine Tool Plant's T4680 high-precision horizontal jig boring machine (first prize), with a positioning accuracy of ±3 μm; the Shanghai No 1 Machine-Tool Plant's YP 7163D conical-wheel gear-tooth grinding machine (first prize); the Chongqing Machine-Tool Plant's YC 8180 tempered gear-hobbing machine (first prize), which can hob tooth surfaces with a hardness of Rc 56-60 attaining JB 179-83 precision class 6, with a surface roughness of Ra 0.63 μm, and can decrease gear grinding time by 80-90 percent in the case of semifinish hobbing; the Shenyang No 1 Machine-Tool Plant's S1292 high-precision NC lathe (second prize), which can machine such high-precision parts as magnetic drums; the Hanjiang Machine-Tool Plant's SGK 7303 high-precision micrometer screw grinder (second prize); the Hangzhou Machine-Tool Plant's HZ-037 slow-feed form grinding machine (second prize); the Ningjiang Machine-Tool Plant's MK 2932B and the Shanghai No 3 Machine-Tool Plant's MK2945 NC jig grinding machine (both second prize); and the Wuxi Machine-Tool Plant's MZ 202 and MZ135A automatic bearing-ring internal/internal-flute grinding machines (second prize). Other examples include the super-high-precision lathe and milling machine that the Beijing Machine-Tool Research Institute developed to meet the needs of sophisticated industries such as astronautics. The lathe won a first-class Spring Swallow award at the first exhibition.

IV. Coordinated Development of Machine Tools and Cutting Tools, Abrasive Tools, Accessories and Attachments

The development of machine tools andof the production technology for cutting tools, abrasive tools, accessories and attachments inevitably both promote and constrain each other. As described above, the development and specialized production of domestic NC system equipment has promoted rapid progress in China's NC machine tools and similar technology, but in addition, new products embodying coordinated development include, in the tool area, the development of a variety of multisided hard-alloy tips and titanium nitride-coated tips developed by many tool plants. For example, the Shanghai Tool Plant produced a TiN[titanium nitride]-coated high-speed steel gear-hobbing tool (first prize), the Chongqing Tool Plant developed a hard-alloy high-speed hobbing tool (second prize), the Harbin No 1 Tool Plant produced a Zerol-gear [i.e., curved-tooth bevel gear] milling tool series (first prize), and the Hanjiang Tool Plant developed the M2-M25 hard-alloy gear-hobbing tool [series] (first prize). All of these products were developed in order to improve gear machining processes. The Guangzhou Tool Plant's CABS tool system (second prize) and the Shanghai No 1 Machine-Tool Accessory Plant's TMG modular tool system (second prize) were developed in coordination with machining centers. These new products all are suited to the needs of current high-speed, high-efficiency cutting-process and NC machine tools and machining centers.

In the area of abrasives and abrasive tools there are a variety of high-precision grinding wheel and high-speed, high-efficiency, superhard abrasive grinding wheel products. They include the 60 m/sec high-speed crankshaft grinding wheel with a diameter of 1100 mm produced by the No 1 Grinding Wheel Plant (second prize), as well as its grinding wheel for machining bearing rings and its mirror grinding wheel; the single-line thread-grinding wheels (first prize) 350-400 mm in diameter, the dish grinding wheels 350-400 mm in diameter (second prize), and the high-precision slideway grinding wheels produced by the No 2 Grinding Wheel Plant; the high-precision gear grinding wheels (second prize) 280-340 mm in diameter produced by the No 4 Grinding Wheel Plant; the synthetic-diamond circular saw blade (first prize) 2200 mm in diameter, the synthetic-diamond composite optical grinding wheel (second prize), and the double-ended surface grinding wheel 750 mm in diameter produced by the No 6 Grinding Wheel Plant; the cubic boron nitride (CBN) grinding wheels produced by the Zhengzhou Abrasives and Grinding Tools Research Institute and the Beijing Diamond Plant; the synthetic diamond wheel for color television picture tubes, which replaces an imported product (first prize), and the synthetic diamond flat grinding wheel 600-750 mm in diameter (first prize) produced by the Shanghai Grinding Wheel Plant; and the slow-feed power grinding wheel produced by the Beijing Grinding Wheel Plant. In recent years the Zhengzhou Abrasives and Abrasive Tools Research Institute has developed synthetic-diamond hard-alloy composite segments, and CBN hard-alloy composite plates (first prize) which can withstand temperatures of 900-1000°C and have rather high impact resistance; these are new cutting-tool materials with great applications value. Demonstrations during the exhibition attracted great interest.

In the area of measuring tools and instruments, in addition to a variety of digital display measuring tools, the exhibition also included: the CZ-450 instrument for measuring overall gear error, equipped with a computerized data processing device (first prize), developed by the Chengdu Tool Research Institute; the WSC-150 low-pitch threat dynamic inspection instrument (first prize) produced by the Chengdu Measuring and Cutting Tool Plant; the HYQ 035/1 roundness gauge (first prize) produced by the Shanghai Machine Tool Plant; the model 2204 surface-roughness gauge produced by the Harbin Measuring and Cutting Tool Plant; a variety of electrical and pneumatic measurement instruments produced by the Zhongyuan Measuring Instruments Plant; and numerous inductive synchronizers, optical gratings, magnetic gratings, code disks and similar measuring components and digital meters produced by various plants for use in machine-tool displays. In the last few years, the Shanghai Machine-Tool Plant, the Kunming Machine-Tool Plant, and the Beijing Machine-Tool Research Institute have developed three-coordinate measuring devices. The Kunming Machine-Tool Plant exhibited the CLZJ80 three-coordinate measuring device, which is based on technology imported from the Sheffield company (U.S.). This machine uses micro-processor-enhanced-accuracy (MEA) technology. It stores 21 types of mechanical errors in fixed format for automatic corrections, resulting in higher three-dimensional precision (0.016 mm) and repeatibility (±2 μm). In addition, the Ningjiang Machine-Tool Plant produces the CLW60 multiple testing device in conjunction with its coordinate grinder; its positioning accuracy is 3 μm and its measurement range is 600 x 400 x 400 mm.

Machine-tool accessories, especially attachments, have always been a weak link in the industry, but there have been considerable improvements in recent years. Some specialized production plants have produced many new products. Examples include: the FK14160B divider head (first prize) and the TKL 315 NC vertical and horizontal rotating work table (first prize), produced by the Yantai Machine-Tool Accessories Plant; the KEF 250 center-hole high-speed hydraulic chuck (first prize), produced by the Shanghai No 2 Machine-Tool Accessories Plant; the KM 318A adjustable precision chuck (second prize), produced by the Hohhot Machine-Tool Accessories Plant; the high-speed drilling and milling head (second prize) produced by the Yunnan Machine-Tool Accessories Plant; and the F 213A and F 214A universal boring head (second prize) produced by the Weihai Precision Machine-Tool Accessories Plant. In addition, precision end-gear and air-cushion divider tables, fast-change lathe tool rests, spring clamps, high-speed grinding heads and the like won second and third class Spring Swallow medals at the second exhibition. Many machine-tool accessories and functional components supplied by specialized production plants, such as a ball-bearing lead-screw attachment, a rolling slide block, a linear-motion roller guideway, machine-tool nameplates, cylindrical guideway liners, guideway guards, guideway scrapers, flexible cable pullers, lead-screw guards, a variety of chip-removal devices, machine-tool anti-vibration bases and a variety of machine-tool control components also won Spring Swallow awards. Other examples included devices developed to increase the cleanness of machining and surface smoothness such as the QXLT 40-II-G01 spray washing, rinsing, and drying unit developed by the Qingquan Filtration Machinery Plant in Dalian; the QQDL250 vertical vibratory finishing machine (second prize) produced by Dalian Plant No 5706, and a variety of burr-removal and polishing machines.

The backward state of production of electrical devices for machine tools was a key factor hindering machine-tool production quality and reliability. Foreign merchants sometimes had to completely remove and replace them in machine tools exported by China. In the last few years, as a result of cooperative production, the quality of Chinese machine-tool electrical equipment has been greatly improved. Machine-tool electrical components (contacters, starters, relays, changeover switches, master control switches, position switches, electromagnets, electromagnetic clutches, machine-tool transformers, electromagnetic counters and plug-in parts) are being produced in essentially new product series, and all old series-produced products have been modernized. This was the result of importation of West German (Siemens, Situomake [phonetic] and the like), Japanese (Fuji Electric Company), and U.S. (Weikesi [phonetic]) machine-tool electrical-device production technology. This technology was assimilated, preliminary materials standardization and domestic materials production were instituted, a series of difficult problems in mold fabrication and process equipment were solved, and testing and measurement equipment were steadily improved, so that certain key enterprises (such as the machine-tool electrical-equipment plants in Shanghai, Tianjin, Shenyang, Neijiang (Sichuan), Beijing, Tianshui, and Suzhou) developed batch production capabilities, creating a new situation for machine-tool component supply and export.

V. Research and Development Are the Basis for Technological Progress

In the past, owing to our technological weakness and the lack of necessary research facilities, the research cycle was long, product development was slow, and we were rather far behind other countries.

Since 1978, while energetically importing advanced foreign production technologies, such organizations as the Beijing Machine Tool Research Institute also purchased numerous machine-tool experimentation equipment and the corresponding software packages. With these advanced facilities, our industry's experimental research (such as measurement of machine-tool rigidity, vibration, thermal deformation, noise, main-axle rotation accuracy and gearing chain accuracy) were automated or semiautomated. In particular, the dynamic performance of structures not only could be tested rapidly, but could be displayed dynamically, making possible realistic imaging of the dynamic condition of structures. By making use of specialized analystical software it has also become possible to identify the weak links of structures and ways of improving them and to determine the results of certain improvements, which has greatly increased the efficiency of experimental studies and the quality of data analysis and processing; this provides scientific data for accelerated development of new products and for structural improvement of old products, all of which has produced real results. For example, the Yunnan Machine-Tool Plant and Xi'an Jiaotong University cooperated in an experimental investigation and took structural-design and noise-insulation steps that increased the dynamic rigidity of the CYPHU 400 high-speed horizontal lathe (second prize) by 61.6 percent. The vibration at top speed (2000 rpm) was decreased to less than 76.5 dB(A) or 77.5 dB(A); heating and thermal deformation were also greatly decreased. In addition, the Beijing Machine-Tool Research Institute did experiments on the temperature rise and thermal deformation of the DM7732 NC linear cutting machine tool, set up a mathematical model of thermal displacement in the machine, and then used its NC system for error compensation, obtaining better than 75 percent compensation of thermal deformation (for details, see No 8, 1986, of this journal).

We not only have made a start in mastering certain advanced research techniques and new-product development technologies, but in addition, we have assimilated and redeveloped certain imported technologies and have developed a group of software systems that are suited to China's conditions and are suitable for widespread domestic use. Examples include the Dalian Modular Machine-Tool Research Institute's modular machine-tool CAD system (first prize); the CAT (computer-aided testing) software developed by the Beijing Machine-Tool Research Institute for testing machine-tool capabilities; the microcomputer-assisted group-technology/integrated manufacturing information system (second prize) developed by the Jinan No 2 Machine-Tool Plant; the three-coordinate NC programming system (second prize) developed by the Central China Institute of Technology [now Central China Science & Engineering University]; the CAM/SS numerical-control programming system (second prize) developed by Institute No 625 of the Ministry of Aviation Industry; the intelligent CAD system developed

by Dalian Engineering Institute for axle, bushing, and gear components; CAD software for housings and enclosures and forhydraulic systems; and the three-dimensional mold-visualization software developed by Qinghua University.

In addition, the Dalian Modular Machine-Tool Research Institute developed a CAPP (computer-aided production-process planning) system for housings and enclosures, the Beijing Union University's Institute of Machinery and the Beijing Optical Instruments Plant jointly developed a CAPP for irregularly shaped parts, Xi'an Jiaotong University developed a CAPP for machining parts consisting of solids of rotation, and the Beijing Iron and Steel Institute and Beijing People's Machinery Plant jointly developed a microcomputerized CAD/CAPP/CAM system for cams. Most of this software is based on the Auto CAD system with DBASE-II or DBASE-III data base support and is implemented on IBM PC/XT, AT, and compatible computers, and has Chinese-character interactive capabilities, making it easy to master and convenient to use.

In addition to software research and development, we are engaged in vigorous development in the high-technology area. For example, as a result of assimilating foreign technology, flexible manufacturing systems (FMS) have been developed or are now under development. In 1985 the Beijing Machine-Tool Research Institute developed the JCS-FMS-1 flexible manufacturing system for machining servomotor parts. The Jinan Research Institute of Casting and Forging Machinery and the Great Wall Switch Plant are developing an FMS for machining plate material, the Dalian Modular Machine-Tool Research Institute and the Dalian Refrigerator Plant are developing an FMS for machining refrigerator compressor housings, and the Qinghai No 1 Machine-Tool Plant and the Dalian Modular Machine-Tool Research Institute are preparing for joint development of an FMS suited for standardized parts and enclosures of machine tools, motor vehicles, engineering machinery and farming machinery. Some of these projects are experimental, their capabilities still leave something to be desired, they still have not produced any effect in actual production, and some of them are still in the research and developmental stage and need further work; but the testing and research not only will train personnel but in addition will make it possible to gain an understanding of difficult points in the development of high technology, paving the way for accelerated technical progress in machine-tool production. [Note: the preceding sections have been highlighted in JPRS-CST-88-023, 5 Dec 88, pp 126-27].

VI. Accelerate Progress During Reform, Begin to Catch Up, and Advance Toward the Future

The reform of our economic system is still underway, the planned commodity economy is still imperfect, and the machine-tool industry's technological advance and development of its productive capabilities are still subject to numerous constraints. We are still considerably behind the industrially developed countries in product quality and technical level, and we must still make reform more thorough, overcome obstacles, and accelerate our advance. In the future, our machine-tool industry not only must provide usable sets of superior-quality machine-tool products to the machinofacture

[i.e., machine manufacture] industry for key state development tasks, but it must also enter international markets, expand international exchange and cooperation, and increase its competitiveness. This will enable us to reap good economic benefits and also to accelerate technical advances and narrow the gap as fast as possible. At the same time, we must keep abreast of international trends in high technology so that in the not-too-distant future we will be able to narrow the gap, catch up with international technical progress, and reach the world forefront.

Current industrial production has also entered the stage of high-level automation, i.e., of flexible automation and intelligent automation, and is entering the stage of computer integrated manufacturing (CIM) systems. This is the mainstream of current technological advance. We already have a certain foundation in computer numerical control (CNC) applications; we have obtained results in research related to programmable logic control (PLC), flexible manufacturing technology (FMC, FMS) and industrial robots; CAD, CAPP and CAM development is proceeding, and computer assisted management and office automation (OA) are being spot-tested in machinofacture plants. These are real results that indicate technological progress but also form the high-technology basis for conversion to integrated plant systems. CIM is a popular research and development subject worldwide, and outstanding results have already been obtained in many areas, such as production-engineering computer network technology, materials requirements planning (MRP-I) and manufacturing resources planning (MRP-II) technology, just-in-time (JIT) production technology, manufacturing automation procedures and technical operating procedures (MAP/TOP), production-process statistical analysis and control (SPC) technology and the like. These are all subjects in which we must keep abreast of high-technology requirements and do further research. We may assume that in order to catch up with the development of high technology, the first requirement it to step up research, development and applications in the above new technologies, accelerate their conversion to productive capabilities, obtain realistic technological progressin the course of actual production, and gradually accumulate CIM unit technologies. Second, we must establish CIM test projects as rapidly as possible [see JPRS-CST-89-006, 28 Feb 89, p 86], use the policy of opening up both domestically and abroad, and strengthen international cooperation, so that the projects become a research and experimental base for CIM, gradually acquire the abilities and trained personnel to take on CIM engineering design, and make sound technical preparations for the establishment of a Chinese CIM industry in the next century. We must also conduct spot experiments in enterprises that are well positioned for technical advance, hand down requests to implement CIM programs at various paces, start solving the weak links in the system, and implement it stage by stage. Carrying out the above ideas will guide us toward the future and will make CIM system technology available to the machinofacture industry.

Modernizing Production Engineering

40080047c Beijing JICHUANG [MACHINE TOOLS] in Chinese No 8, 1988 pp 6-9, 30

[Article by Tan Rumou [6223 3067 6180], Vice Chairman of ICPE '88 Organizing Committee: "Implement a Policy to Deal with Current Production Engineering Tasks"]

[Excerpts] Editor's note: To acquaint our readers with the general outline of the theme reports presented at the 1988 International Conference on Production Engineering (ICPE '88) in Beijing, we asked the author to summarize these reports. The full texts are found in the volume of collected papers, which is available for purchase from this journal's reader-service department.

The ICPE '88 conference in Beijing, organized by the Production Engineering Institute of the China Mechanical Engineering Society (PEI/CMES), the International Institute for Production-Engineering Research (CIRP), the U.S. Society of Mechanical Engineers (SME), the Japan Precision Engineering Society (JSME) [Japanese Society of Mechanical Engineers] and the U.K. Institute for Production Engineering (IProdE), was held on 1-5 September at Qinghua University. The main theme of the conference was "Tasks of Modern Production Engineering: Increasing Productivity, Quality, Flexibility and Automation." The main purpose of the meeting was to allow exchange of the latest results and experience in production engineering in order to promote full understanding and cooperation.

A total of 230 reports by specialists, professors and engineers from China, Japan, Germany, Holland, Belgium and the United States were received. The academic committee of PEI selected 109 papers for discussion at the conference and included them in the conference proceedings. The papers dealt with the following six areas: (1) metal cutting and stone machining, (2) grinding and physical machining, (3) machine-tool structure and optimization, (4) automation of design and manufacture, (5) measurement and quality control, and (6) thematic reports (summary discussions). Below we excerpt and summarize the contents of several of the thematic reports. [Passage omitted]

2. China's Prospects for Development of Advanced Manufacturing Technology[1]

China is far behind the technologically advanced countries in machinofacture. For example, our average single-machine productivity is only one-tenth that of the United States and Japan, and labor productivity of all personnel is only one-twenty-fifth that of the United States and Japan. As a result, in order to increase productivity and product quality and decrease production costs, China's machinofacture industry has an especially great need to develop and use advanced manufacturing technologies, and particularly to adopt advanced cutting and abrasive tools and advanced process methods and to use all types of NC machine tools, FMC's [flexible machining cells] and FMS's [flexible manufacturing systems]. To keep abreast of worldwide

high technology, we also must make effective preparations to develop toward CIMSs [computer integrated manufacturing systems]. As a result, using these automated high-technology products will be the main trend in the development of China's manufacturing technology.

We already have a rather large-scale machine-tool and tooling industry with strong productive capabilities, and we have accumulated many years' experience in developing new processes and technologies and in developing and applying NC machine tools. This provides us with favorable conditions for developing and applying advanced manufacturing technologies. But we must realize clearly that we are still a developing country, that our per-capita national income is still very low, and that modernized production requires large investments, but funds are in extremely short supply; in addition, our level of enterprise management is low, our market mechanism is not fully developed, electronics components are rather expensive, batch size in NC machine-tool production is still small, and the price of a full-featured NC machine tool is still 15 to 20 times that of an ordinary machine tool. As a result, in the near term the rapid adoption of relatively full-featured NC machine tools and large-scale use of FMS's in ordinary enterprises will be difficult to achieve. In order to raise productivity, improve product quality and decrease production costs, we must first rely on advanced tooling and process methods and improve production management. But we must also bear inmind the small number of modern large enterprises whose economic strength and technical level already give them the need and ability to use such high-technology products as NC machine tools, FMC's, and FMS's. As electronic components improve and their prices fall, the cost of high-technology products will also decline greatly, and the technical attainments and management standards of ordinary enterprises will also gradually rise; as a result, the number of enterprises using the above advanced manufacturing technologies will gradually increase. Thus, in addition to continuously developing new machining methods, during the Seventh 5-Year Plan the government will fund research organizations and production plants engaged in the joint development of 12 FMC's and 3 FMS's. One of the three FMS's is a line for machining housing parts developed cooperatively with the KTM company (U.K.); another is a housing-machining line that we developed independently; and the third is a sheet punching and shearing line, also developed independently. In addition, some enterprises will choose NC machine tools and FMC's in accordance with their own financial capabilities and requirements in order to lay the groundwork for future development of FMS's. As a result, when purchasing NC machine tools, we must consider their integration into production lines. In addition, when we produce NC machine tools and FMC's, we must consider the possibility of tool magazine expansion and potential for system integration into production lines. [Note: the preceding paragraph was highlighted in JPRS-CST-88-023, 5 Dec 88, p 128.]

China's current technical and economic structure is hierarchical, which requires that the technical capabilities of NC machine tools also be multileveled. In terms of current enterprise requirements, there is a pressing need to develop a class of NC machine tools intermediate between

full-featured and economy models; this class will have prices about 2 to 3 times those of ordinary machine tools, in order to meet the needs of medium and small-size enterprises.

Some experts suggest the "independent manufacturing island" concept* for China's specific circumstances. This is a manufacturing system made up of multiple machine tools which has a certain independent and closed character. In terms of hardware, the arrangement of the machine tools is an improvement over the traditional group arrangement. Based on the group-technology principle, they are converted to a closed-unit machining process system. In terms of software, the independent manufacturing island makes thorough use of computers for process design, job scheduling and tool and fixture management, forming relatively independent production systems that increase the efficiency of production preparation and the continuity of material and information flows. It is a production system that is based on group technology and combines NC machine tools with ordinary tools, enhancing them with software. Although the independent manufacturing island is not highly automated or integrated, it is expandable, is readily compatible with existing production systems and requires relatively little investment. This suggestion is already being taken seriously by the relevant enterprises, and three different types of plants are implementing it.

3. Guidelines and Tactics for China's Development of Advanced Manufacturing Technology[2,3]

Based on the current status of China's machine-tool and tooling industry, the extent to which it lags behind other countries, the development trends in foreign machinofacture technology, and China's economic and technical development capabilities, our strategic idea for implementing the three major tasks of modern production engineering is as follows.

(A.) We take as our objective the gradual provision of usable, high-precision, high-quality, sophisticated automated machinofacture equipment and flexible manufacturing systems to the various machinofacture departments. We take as our breakthrough point the assimilation of imported NC technology, mastery of its domestic production and development of our own NC systems--giving priority to satisfying the needs of key development projects in energy, communications and transport, and the extractive industries for sets of process equipment. We focus on the development of precise, high-efficiency, large-scale NC machine tools, FMS's, and forging equipment; the development and widespread introduction of hard-alloy tools, coated cutting tools, and superhard abrasives and abrasive tools; and the development of digital-display, numerical-control, precision, and large-scale measuring devices and instruments; of on-line measurement and error compensation technologies; and of accessories for precision and large-scale NC machine tools in order to increase the precision, efficiency, and utilization of these machine tools.[3]

*See "The Independent Manufacturing Island," JICHUANG [MACHINE TOOLS], No 4, 1987, and "Independent Manufacturing Island Program Design," JICHUANG, No 5, 1988.

(B.) More than 70 percent of China's machinofacture industry consists of enterprises engaging in medium- and small-batch production, with only a few enterprises engaged in true mass production; thus, most of the production in China's automotive, tractor, engineering machinery, motive power machinery and textile machinery plants consists of multiple variety, medium-batch or medium-to-large-batch production. For a rather long time to come, these enterprises will still be the object of key state investments. As a result, in developing FMS's, we must focus primarily on the medium- and large-size housing pieces that these enterprises produce in multiple-variety medium- and large-scale production. Because machining processes for these pieces are complex, machining sequences are long, and accuracy requirements are high, they are the key to these enterprises' production and are the focus of technological modernization and increased sophistication of manufacturing processes; in addition, these enterprises all produce good economic benefits, are economically strong, and have a good technological base.

Flexible manufacturing lines (FTL) consisting of NC machine tools (i.e., turret-type modular machine tools), three-coordinate machining cells (i.e., machining centers of adaptable group systems) and automatic-change box-type machine tools (multiaxis machining centers) have slightly lower flexibility (they are adapted to only 3-5 varieties), but their productivity is rather high (1000-5000 units a year). These FTL's can enable the types of plants listed above to adapt rather rapidly to market changes.

(C.) Because flexible automated manufacturing technology is also many-leveled, the technical requirements and the investments that are needed differ. Since China's technological base is rather weak and funds are in short supply, at present we should develop primarily economy-type flexible machining cells and systems. Straight-line FMS's consisting of machining centers and truck conveyors or materials-transport systems need not be on a very large scale (they generally include only 2-4 machining cells--the maximum is 6-7) but they must have the potential for gradual expansion. Such FMS's can satisfy the needs of enterprises engaged in multiple-variety medium- and small-batch production (these account for about 70 percent of the total number of enterprises and have an annual output of less than 10,000 pieces); the cost of building them and their complexity are manageable by Chinese enterprises. Actually, in recent years, about 90 percent of FMS development worldwide has involved such rather-small-scale FMS's.

(D.) While developing flexible manufacturing technology, we must concentrate particularly on standardization and versatility, because such equipment suited to flexible manufacturing technology as NC machine tools, FMC's, FTL's, and FMS's all are tailor-made products. They are all built for the machining of specific products, using large numbers of multi-purpose modules and a few special-design components. As a result, in the initial stage of development of flexible manufacturing technology, a strong emphasis must be laid on standardization and versatility, including the construction of uniform standardized modular structures; systematic drafting of organizational principles for a variety of process uses;

documents on standard process principles and typical arrangements and technical documents on guaranteeing reliability; control principles, organizational principles, and standardized control software documentation; and FMS process preparation and standard documentation used in FMS production. These measures will allow smooth development and effective application of flexible manufacturing technology in China, yielding excellent economic and social benefits.

(E.) Full attention must be given to the human factor and to training. Flexible manufacturing technology is an advanced production technology and a complex applications technology. Its use has eliminated the labor of ordinary workers but has increased engineering and technical labor. Its productivity and economic benefits depend on whether the system can operate continuously and whether malfunctions can be eliminated quickly. This requires advance training of the personnel who will operate the equipment involved in flexible manufacturing technology so that they have very high technical attainments. Currently, the specialized knowledge of China's engineering and technical personnel is too narrow and division of labor is too detailed. Designers do not understand processes, mechanical specialists do not understand electricity, operators cannot program, and so on, a situation that is very poorly suited for the needs of modernized production technology and management. As a result, we must draft new special instruction outlines so that engineering and technical personnel and users of advanced production equipment have a knowledge of mechanical, electrical and fluid science and the ability to operate and repair both software and hardware. Otherwise, even if we have advanced production equipment, it will not lead to increased productivity, improved product quality, and decreased production costs. [Passage omitted]

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Notable Products from Great Wall Plant

40080047d Beijing JICHUANG [MACHINE TOOLS] in Chinese No 8, 1988 p 56

[Article: "Notable Superior Products from the Great Wall Machine-Tool Plant"]

[Text] The Great Wall Machine Tool Plant is China's largest hydraulic copying-lathe production plant and one of the earliest plants in China to develop and produce numerical control [NC] machine tools.

The plant has a full complement of technical personnel, its measurement and testing facilities are excellent, and it has a variety of advanced machining equipment. In recent years it has engaged in technical exchange and cooperation with leading firms in Japan, the United States, and Italy, and its product quality has improved steadily. The CE 7112 copying lathe has won two state silver medals for quality. The CK 7815 NC lathe is China's first such lathe to win a silver medal for quality; it also won a 1988 superior-product model award, class 2, at the China Machine Tool and Tooling Exhibition. The CKS 7832 four-spindle NC lathe won the 1988 China Machine Tool and Tooling Exhibition "Spring Swallow" award, class 2. The CJC-FMC1 lathe-work flexible machining cell is one of the plant's new products.

In addition to series production of copying lathes and NC lathes, the plant also produces automated lathe-work lines, modular machine tools, special-purpose machine tools and ordinary lathes.

Its products are sold in more than 30 countries and areas and are eagerly bought by numerous purchasers.

The NC Lathe

The plant's NC lathes are equipped with a FANUC programmable controller, which has a full range of features and is easy to program. It can be combined with the FANUC industrial robot for unattended operation. It is capable of quick, reliable automatic tool changes and can be positioned rapidly.

The machine has a horizontal bed and a vertical or inclined slide. It has high power, good rigidity and high efficiency, and is convenient to operate, with easy chip removal. It can be combined with an automatic workpiece loading and removal device and is capable of fully automatic operation. The main axle can change speed automatically under load, can perform constant-speed cutting, and is suitable for power turning.

The lathe can be used for automatic turning of cylindrical, conical and stepped shapes and other curved solids of rotation. Cutting accuracy is high. It can also turn both metric and English system threads, cut clots and perform drilling, reaming and boring. It is suitable for one-off and medium- and small-batch production.

The machine can be combined with all foreign-produced NC equipment and with AC or DC main motors and DC servomotors.

Main Technical Characteristics	CKS 7832	CKS 7840
Maximum turning radius, mm, bar type	320	400
disk type	600	600
Maximum turning length, mm	1000	1500
Main axle speed range, rpm	25-2500	20-2500
Longitudinal feed rate, mm/revolution	0.01-500	0.001-500
Longitudinal free movement speed, m/min	9	9
Turret tool positions	12	12
Main motor power, kW	30 AC	45/55 DC
Net weight, kg, approximate	9000	8000

The Copying Lathe

The plant has about 30 years' experience in producing hydraulic copying lathes. The CE 7112 model won state silver medals for quality in 1979 and 1984.

This machine tool can copy a sample or template to produce cylindrical, conical, and stepped forms and other rod and disk solid-of-rotation pieces. It has high power, high rigidity and a high degree of automation and is suited for power turning. The main axle can change speed automatically, producing essentially equivalent turning speeds. The carriage can automatically change between preset feed rates while under load. The machine is suited for batch and mass production in the automotive, tractor, electric-motor, machine-tool and petroleum-machinery industries.

Main Technical Specifications of the CE 7112 Copying Lathe

Maximum turning radius	125 mm
Maximum turning length	710 mm
Main axle speed range	320-2000 rpm
Longitudinal feed rate of carriage (continuous)	50-700 mm/min
Angular range of pattern turning	-30° to +90°
Main drive motor power	10 kW
Dimensions	3200 x 1200 x 1800 mm

In addition, the plant produces the CB 7225 and CE 7132A copying lathes, and it recently developed the CJC-FMC1 lathe-work flexible machining cell and the CKJ 7812 economy lathe.

Bundle Adjustment of SPOT Imagery

40080055 Beijing CEHUI XUEBAO [ACTA GEODETICA ET CARTOGRAPHICA SINICA] in Chinese Vol 17 No 3, Aug 88 (manuscript received 23 Jan 88) pp 162-170

[Article by Li Deren [2621 1795 0088] and Cheng Jiayu [4453 1367 0827], Wuhan Technical University of Surveying and Mapping: "Bundle Adjustment of SPOT Imagery"]

[Excerpts] Abstract: The high resolution and excellent base-height ratio of SPOT stereoscopic images makes it possible to process them accurately and efficiently with analytical photogrammetric instruments. Spatial triangulation must be performed to provide orientation parameters for analytical plotters, orthoprojectors and digital image-correlation systems. The geometry of the SPOT images is discussed and a mathematical model described. A bundle-block adjustment program for CCD [charge-coupled device] linear array imagery has been developed. Results of the processing of a panchromatic SPOT stereo pair from the Marseilles area in southern France are described and compared with results obtained by the University of Hannover.

The SPOT-1 satellite, launched by the French Center for Space Research on 22 February 1986, includes a remote-sensing system that can be used for photogrammetric purposes, with two CCD linear-array sensor systems, each strip of which can cover a strip of ground 60 km wide when vertically oriented. Each sensor can operate in the panchromatic or multiband mode. In the panchromatic mode (0.51-0.73 μm) the recording density is 6,000 pixels per meter, with a ground resolution of 10 m. Each sensor's mirror can be tilted at an angle of up to 27° relative to the axis of flight (Figure 1). As a result, images of a ground area 950 km wide can be obtained during each orbit. Images of the same area obtained in separate orbits can be combined as stereo pairs with an excellent base-height ratio.

The use of SPOT stereo pairs with high-precision geometric characteristics to draft 1:50,000 and 1:100,000 scale topographic maps is now a subject of worldwide interest, which necessarily involves phototriangulation of the images. This work will provide orientation parameters and other data for the operation of analytical plotters, orthoprojectors and digital image correlators. Below we discuss a bundle-adjustment method for use with the SPOT images and test it on a specific image pair.

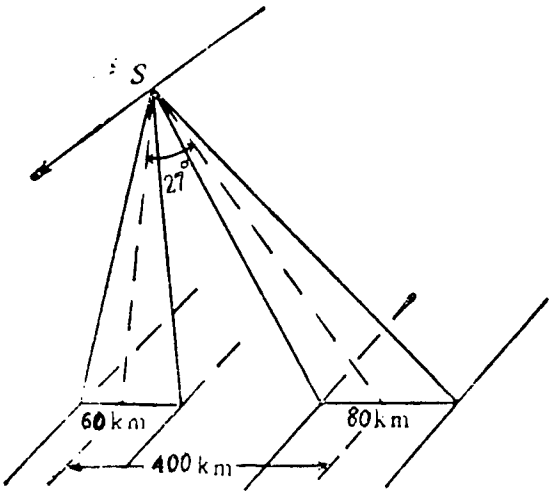


Figure 1

1. The Mathematical Model

A. Coordinate Systems

We first define the instantaneous coordinate systems used in CCD scanning (Figure 2).

Since the SPOT images (6,000 x 6,000 pixels, size 15 x 15 cm) overlap laterally, we use the direction of flight as the y axis in Cartesian coordinates (Figure 3).

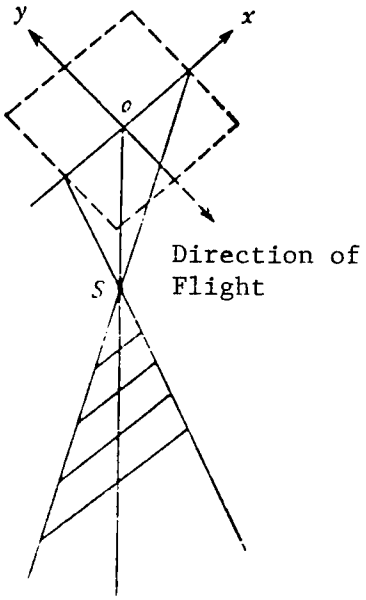


Figure 2

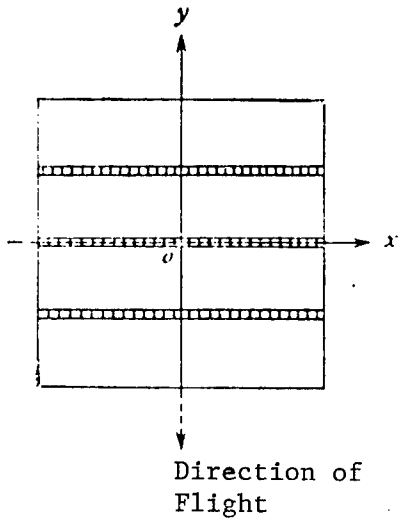


Figure 3

Because each SPOT stereo pair covers a rather large area (about 60 x 60 km), the locations of the control points must be specified in real geodetic coordinates, i.e., geocentric coordinates. But geocentric rectangular coordinates generally involve excessively large numbers; as a result, during computations an ordinary linear spatial transformation can be used to convert them to local tangential rectangular coordinates. The coordinate systems used for ground-control points in the present paper are as follows:

--Gauss-Kruger retangular coordinates, (X_T, Y_T) and height h (also called the normal height);

--geodetic coordinates, i.e., the latitude L, the longitude B, and the height H;

--geocentric rectangular coordinate $(X_{geo}, Y_{geo}, Z_{geo})$;

--tangential rectangular coordinates $(X_{tan}, Y_{tan}, Z_{tan})$.

Tangential rectangular coordinates are used for the adjustments, and the coordinates of the control points must therefore be converted to this system by the following procedure:

$$(X_T, Y_T, h) \rightarrow (L, B, H) \rightarrow (X_{geo}, Y_{geo}, Z_{geo}) \rightarrow (X_{tan}, Y_{tan}, Z_{tan})$$

Following adjustment, the mapping is done in Gauss-Kruger rectangular coordinates; for convenience, all control points are converted to these coordinates. The procedure is:

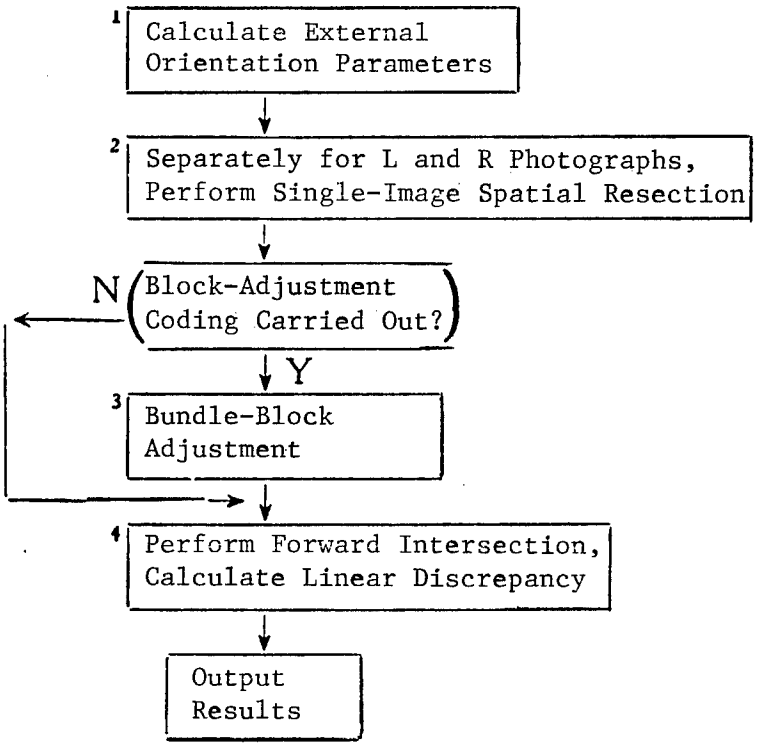
$$(X_{tan}, Y_{tan}, Z_{tan}) \rightarrow (X_{geo}, Y_{geo}, Z_{geo}) \rightarrow (L, B, H) \rightarrow (X_T, Y_T, h)$$

The conversion formulas may be found in Ref. 3 or in works on satellite geodesy.

An approximate method may also be used to convert between Gauss-Kruger coordinates and tangential coordinates and to correct for the curvature of the earth. [passage omitted]

2. Program Organization

The mathematical model was implemented in FORTRAN-77 on a Siemens computer. The program flowchart is as follows:



Flowchart

Program Description

A. Three methods can be used to calculate the initial values of the external orientation elements:

--Recorded orbital parameters may be used.

--X_{SO} may be calculated from the known mirror inclination angles, using the average Y coordinate of the control points for Y_{SO} and setting $Z_{SO} = h$; the approximate values of ψ, ω and k taken as zero in Eq. (2).

--The SPOT images as plane-centered projections (i.e., frame images), finding the external orientation elements of the center point from the relative orientation and absolute orientation (determined simultaneously from the left and right images).

B. Eq. (8) is used for resection; there are only 12 unknowns in X_1, and $X_3 = 0$, so that the unknown points are not involved in the adjustment.

C. Bundle block adjustment is made with Eq. (8).

D. For the forward intersection, the external orientation parameters calculated from step (2) or (3) in the program are used to find the coordinates of the ground points; both the control points and the check points are involved in the adjustment, and their linear discrepancy is determined.

After relative and absolute orientation, the program uses the data search method to remove gross errors. In the experiment described here, the confidence level was $1 - \alpha = 90$ percent.

In addition, the program must average the coefficients of the error formula so that the coefficient matrix for the normal equations is well conditioned.

The program is currently being transferred to the IBM-PC and installed in a C100 analytical plotter.

3. Test Results

The program was used to process a stereo pair obtained from the Marseilles area in France. The image scale was 1:400,000, the corresponding focal length was f = 2087.4 mm, and the image size was 15 x 15 cm. The left mirror was tilted at 25° 02' and the right mirror at 26° 11'; the base-height ratio was 1:1.05.

The coordinates of the control points were read off a 1:25,000 scale map and rigorous formulas were used to convert to tangential rectangular coordinates. The image coordinates were plotted with a BC2 analytical plotter. A total of 72 resolvable points were measured. Because the base image that was used was a copy, as was the topographic map, the resolution error was rather large for a few points, and these were discarded from the calculations.

In all calculations, the check point values had a weight of 1; the control points were also given a weight of 1 when used as strip-weighted observation values.

The calculation results are shown in Table 1. It will be seen that the vertical accuracies are rather consistent and that the X and Y accuracies vary with the number of control points. This is because the external orientation elements are strongly correlated and half of the area of the photograph was water. In order to assure stability of the solution, the number of control points must be increased. In this experiment, good results were obtained with 27 control points.

The variation in the mean error of the X, Y and Z coordinates of the check points as a function of the number of control points is shown in Figure 4.

Professor G. Konecny et al. of the University of Hannover (FRG) also processed SPOT stereo pairs from the same area, using images recovered directly from CCT [computer compatible tape] magnetic tape. Their calculation results are shown in Table 2.

A comparison of Tables 1 and 2 indicates that the errors in determining the ground points were similar, but it should be noted that the images used in our experiment were copies, while the original images were used by Konecny; consequently, our results may be considered satisfactory.

Table 1. Accuracy of SPOT Image Bundle Adjustment (with Photographic Copies)

		# of Points N	μ_X (m)	μ_Y (m)	μ_Z (m)	σ_0 (μm)
1	Control	37	8.9	7.4	1.5	34
	Check	34	9.8	11.7	9.9	
2	Control	27	9.9	8.1	1.5	35
	Check	44	9.9	10.9	8.5	
3	Control	23	8.4	7.6	1.6	36
	Check	48	17.5	11.3	8.9	
4	Control	12	4.7	7.4	0.7	25
	Check	59	19.2	12.1	8.6	
5	Control	9	4.9	6.2	1.0	25
	Check	63	21.9	16.6	11.7	
6	Total # of Control Pts	66	6.4	6.7	1.6	31

Note: One gross error was removed from each of groups 1-4; 66 distinct easily resolvable points were used in Group 6. $\mu_X = \sqrt{\frac{[\Delta X^2]}{N}}$, $\mu_Y = \sqrt{\frac{[\Delta Y^2]}{N}}$, $\mu_Z = \sqrt{\frac{[\Delta Z^2]}{N}}$

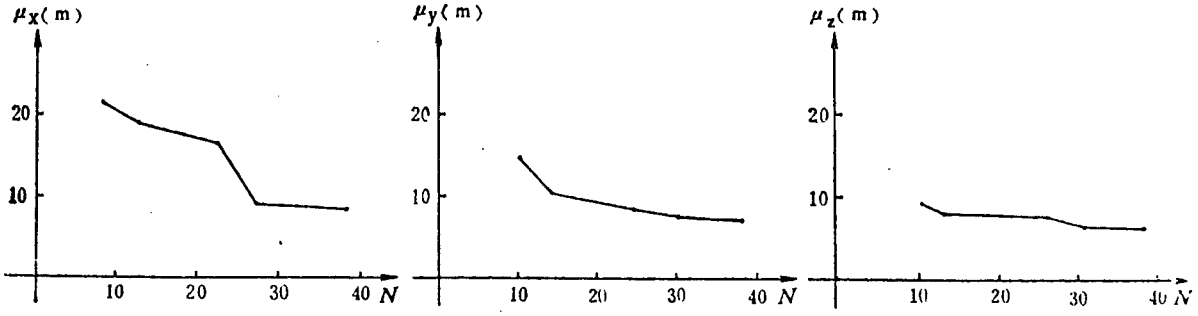


Figure 4

Table 2. Accuracy of SPOT Bundle Adjustment Performed by the University of Hannover (original images)

# of Adjustment Points	# of Control Points	Additnl. Params., L/R	Internal Accuracy				
			σ_0	$\sigma_{XY\,max}$	$\sigma_{XY\,mean}$	$\sigma_{Z\,max}$	$\sigma_{Z\,mean}$
86	18	4/3	8.4	8.7	5.2	10.9	8.5
86	34	3/3	7.9	6.1	4.5	8.8	7.1
89	83	4/5	6.1	4.5	3.0	5.6	5.0

# of Indepndt. Check Pts	# of Control Points	Mean Differences			Mean Square Differences		
		X	Y	Z	X	Y	Z
68	18	7.9	10.4	4.8	10.9	13.7	6.5
52	34	8.3	10.5	4.5	11.3	13.8	6.2

Table 3 shows results obtained by performing resection followed by forward intersection of the left and right images; the external orientation elements at arbitrary instants obtained by block adjustment followed by forward intersection are shown in Table 4.

Table 3. Results Obtained with Intersection Method

# of Control Points		σ_0 (μm)	Mean Position Error of Surface Points						Mean Elevation Error (m)
			$\Delta XY<15$		$15\leqslant\Delta XY<30$		$30\leqslant\Delta XY$		
			Number N'	D_{XY}	N'	D_{XY}	N'	D_{XY}	
24	L	52	57	9.8	15	20.1	0	0	8.6
	R	41							
15	L	57	42	8.7	28	21.6	2	32.7	8.8
	R	32							
12	L	64	41	8.5	29	21.0	2	36.2	9.5
	R	32							
9	L	72	38	9.4	24	21.7	10	33.9	10.7
	R	36							

Note: $D_{XY}=\sqrt{\frac{[\Delta X^2+\Delta Y^2]}{N}}$ $\Delta X,Y$ are in meters.

Table 4. Results of Block Solution for Two Photographs with Successive Resection and Forward Intersection

# of Control Points	σ_0 (μm)	Mean Position Error of Surface Points						Mean Elevatn. Error (m)
		$\Delta XY<15$		$15\leqslant\Delta XY<30$		$30\leqslant\Delta XY$		
		Number N'	D_{XY}	N''	D_{XY}	N'	D_{XY}	
24	35	55	9.8	17	20.0	0	0	8.0
15	24	43	8.8	27	22.0	2	33.0	8.9
12	22	39	8.4	31	20.6	2	38.0	9.2
9	25	38	9.2	26	22.4	8	33.1	11.1

A comparison of the results in Tables 3 and 4 indicates that the average position errors resulting from the use of the resection/forward-intersection method are not significantly different from those obtained by the block adjustment method, but that when there are relatively few points the block adjustment method is preferable for finding the plane of the pair; the two methods have the same average vertical error. For computations with a microcomputer, the convergence of the resection/forward-intersection method is rather poor.

Because the SPOT images were obtained with superlong-focal-length CCD sensors, and because the Y coordinate of the projection of the line center is always zero, the external orientation parameters are very strongly correlated, and the discrepancies between the external orientation parameters obtained with different numbers of control points are rather large. To determine whether this fact would affect the mapping results, we calculated the image coordinates on the DEM grid* for external orientation parameters obtained with different numbers of control points. (In this experiment we made calculations for 39 and 29 control points.) The discrepancies are shown in Table 5.

Table 5. Relative Error of Use of DEM Grid To Calculate Image Coordinates for Different External Orientation Elements (X,Y-Coordinate Relative Error Derived from 450 Grid Points)

	Left Photograph		Right Photograph	
	High Grid $H=600$m	Low Grid $H=0$m	High Grid $H=600$m	Low Grid $H=0$m
$\hat{\sigma}_d$	$\pm 10.0\mu$m	$\pm 6.3\mu$m	$\pm 7.6\mu$m	$\pm 4.3\mu$m
	$0.29\hat{\sigma}_0$	$0.18\hat{\sigma}_0$	$0.22\hat{\sigma}_0$	$0.12\hat{\sigma}_0$
$\lvert\Delta X\rvert_{max}$	13μm		14μm	
$\lvert\Delta Y\rvert_{max}$	20μm		12μm	

Note: $\hat{\sigma}^2_d = \dfrac{\Sigma(\Delta X^2)+\Sigma(\Delta Y^2)}{N_X+N_Y}$

*This grid is used with analytical plotters (see Ref. 4).

As we estimated, with strong ground-point correlation, the discrepancy in the image coordinates on the DEM grid was far smaller than the measurement error of ±35 μm. Thus, the high degree of correlation of the external orientation parameters has only a negligible effect on map plotting.

4. Preliminary Conclusions

The test results lead to the following conclusions:

--The geometrical accuracy of the SPOT images is high. Their planar and vertical accuracy is about 10 m for image copies, and they may therefore be used for 1:100,000 scale topographic maps and for revision of 1:50,000 scale topographic maps.

--With a good base-height ratio, the vertical accuracy is stable, providing a basis for the use of satellite images to obtain digital terrain elevation models.

--When large numbers of control points are used, single-image resection can be used directly to obtain the external orientation parameters.

--Even though the external orientation parameters are strongly correlated, when many control points are used this correlation has a negligible effect on the calculation of ground-point coordinates and on mapping.

Experiments currently in progress on the use of SPOT images for mapping with analytical plotters, the making of orthophotographic images with orthophoto-projectors and the use of digital-image correlation technology to establish DEM have given satisfactory results.

The author expresses his gratitude to the organizations that furnished the photographs and control-point data.

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New High-Power YAG Laser Developed

40080145 Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese
Vol 16 No 3, Mar 89 p 191

[Text] Zhejiang University and Research Institute 3 of the Ministry of Public Security have jointly developed a new type of YAG [yttrium aluminum garnet] laser. This laser's size is half that of a common YAG laser with the same output power, and moreover it is resistant to vibration--it can provide a stable output of light over long periods in very strong vibrational environments. An evaluation group consisting of experts from 10 schools and institutes felt that this is a pioneering development in the construction of lasers, and that the laser's structure is highly original. The laser has a folded resonant cavity construction, and uses an angular prism as the dioptric device. The depolarized state is achieved in a clever manner via changes of the plane of polarization of the three total-internal-reflection surfaces of the angular prism, and after optical compensation of the optical processing error introduced by components within the cavity, the laser is given electro-optic Q-modulation and frequency-doubling functions. The laser can put out 1.06-micron light and 0.53-micron frequency-doubled light with an output power 1-2 megawatts and a pulse repetition frequency of 25/second.

Newly Patented Static RAM Acts as ROM, EPROM

40080123d Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 4, 25 Jan 89 p 2

[Article by Wu Changsheng [0702 7022 4141]: "Multifunctional Static RAM Receives State Patent"]

[Text] The 9964 multifunctional static memory (SRAM [static random access memory]) Changsha University Experimental Plant was awarded a patent in the first part of last year, that patent number being 86210655. This new product is being sold by the Hunan Province branch of the China Computer Development Company.

The 9964 multifunctional SRAM has various functions, such as protection from interrupted service and write-protect, and it can be used as a direct replacement for such RAM and EPROM [erasable, programmable read-only memory] chips as the 6116, 6264, 2716, 2732 and 2764 in single-board computers, single-chip computers, and in intelligent instrumentation. It is both RAM and ROM, and is also an EPROM with EEPROM [electrically erasable programmable ROM] functions, but simpler in operation and needing only a single 5-volt power supply. Input and output for the 9964 is TTL [transistor-transistor logic] compatible.

For customers using a single-board computer or single-chip computer to develop a new product, the chip offers the following primary features:

1. It can substitute for the 6264 or the 6116, and it is completely identical to the 6264 in pin-out and functions, allowing the user to store written programs. Its greatest advantage is that when there is a sudden power interruption, data is not lost, and work can continue upon restoration of power.

2. After work, the user can turn off the machine and leave, even though he has not finished writing his program. He can continue upon turning on the computer once again.

3. When the 9964 is used to develop new products, it can be used as a ROM, and it does not need ultraviolet light to be erased, nor need to be written with high voltage. After the entire program has been written into the 9964, one need only toggle the on-chip microswitch and the 9964 becomes a ROM (preventing writing). Then, take it out, insert it in the test item, and it will run. If further modification is needed, it can be reinserted in the development system, the switch restored (turning it back into a RAM), and individual bytes can be altered. This can be done many times until the user is satisfied.

4. After using the 9964, the user may conveniently modify the monitor program.

5. The 9964 can be used as a never-fail "safe" for data collection and calculation results, and it can greatly simplify customer programs.

New Achievements in Hybrid Integrated Circuits

40080137c Beijing ZHONGGUO DIANZI BAO in Chinese 31 Jan 89 p 3, 3 Feb 89 p 3

[Articles by Qing Feng [7230 1496] and Lü Shaowu [0712 4801 0839]]

[Summary] Six new hybrid-integrated-circuit (HIC) products developed by Research Institute 43 of the Ministry of Machine-Building & Electronics Industry (MMEI) recently passed appraisal in Hefei. The PTJ-02 chip-type-component surface mount machine is China's first independently designed and manufactured all-microcomputer-controlled surface mount unit. Developed over a 3-year period beginning in 1985, this machine is equivalent in quality to that made since 1985 by the Japanese firm Citizen [Watch] Company [Ltd.], and has the following specifications: positioning programming is in BASIC language with man-machine dialogue, capacity is 20 different 8-12mm components, angular error is ±1°, repositioning accuracy from original workpoint is ±0.05mm, mounting precision is ±0.02mm, mounting speed is 1000-1200 chips/hour, and X-Y-Z mobility range is 240mm x 280mm x 8mm. This equipment is intended to replace foreign-made machines (China has so far imported about 100 such units) for specialized purposes such as the high-frequency heads used in color televisions.

The ceramic-glazed steel substrate, a steel plate covered on both sides with a layer of glass and ceramic glaze, has a thermal conductivity $\geq$ 0.014W/cm·°C and a breakdown strength E $\geq$ 20kV/mm. It is suitable for power HIC's.

A thick-film copper conductor material and multilayer wiring dielectric material have been domestically developed for the first time. The former material's performance meets the standards of the U.S. firm Du Pont's DP9922 material. The latter material's performance--dielectric constant < 6, insulation resitance $\geq 10^{13}$ ohms--meets that of Du Pont's DP4575 material.

The M24Lb HIC shell, a shallow-cavity-structure fully hermetic metallic shell, has an air-leak rate $\leq 1 \times 10^{-7}$ atm·ml/s and an insulation resitance > 1 x 10^{10} ohms. It is suitable for use in parallel-seam soldering and laser soldering.

The JHBA precision resistance network utilizes thin-film technology and laser resistance-adjustment technology. Range is 5-100 kilohms, precision is to < 0.1 percent, and temperature characteristics are good (<±30ppm/°C). MMEI's Research Institute 5 has subjected it to rigorous testing to certify it to the H level of the MIL-R-83401C specification.

The HIC CAD [computer aided design] special-purpose computer software [system] is intended for design of HIC's, especially for circuit analysis and multilayer automatic wiring. It will serve as an advanced design aid for microassembly technology.

Briefs

New Ion-Beam Deposition Machine--Beijing's Yanshan [3601 1472] Scientific Instruments Company recently developed a multiple-target ion-beam thin-film deposition machine that meets advanced international standards of the eighties. A rotating device provides up to four different targets for the ion beam. This sputtering deposition technique is useful in research and development of superconductors, metals, semiconductors, insulators, large-scale integrated circuits, optical devices, magnetic information storage devices [i.e., magnetic memories], and so on. [Summary] [40080137a Tianjin ZHONGGUO JISHU SHICHANG BAO [CHINA TECHNOLOGY MARKET NEWS] in Chinese 28 Jan 89 p 1]

New MOCVD Technology--The HgCdTe/CdTe/GaAs multilayer heteroepitaxial film recently developed jointly by Research Institute 11 of the Ministry of Machine-Building & Electronics Industry and the Chinese Academy of Sciences' Shanghai Metallurgical Institute using the MOCVD (metallo-organic chemical vapor deposition) method and equipment of their own manufacture has elevated Chinese research in this area to mid-eighties standards of foreign laboratories. This critical semiconductor material is used in long-wavelength infrared detectors, and also has important applications in thermal imaging, remote sensing, guided missiles, infrared radar, and optical communications. The MOCVD HgCdTe epitaxial equipment and the technology have been technically certified by a panel of experts. [40080137b Beijing ZHONGGUO DIANZI BAO in Chinese 17 Feb 89 p 3]

Study on High T_c Tl-Ba-Ca-Cu Oxide Superconducting Ceramics Without Rare Earth Element

40080105 Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 16 No 5, Oct 88 pp 464-467

[Article by Wan Derui [8001 1795 6904], Huang Tianquan [7806 1131 5425], Ji Xiaoyang [0679 2556 3152], Chen Jiyong [7115 4949 6978], Chen Zhixue [7115 1807 1331], Yang Zheng [2799 3630], Feng Jiamin [7458 1367 1488], and Lai Qiongyu [6351 8825 6877] of the Analysis and Testing Center, Sichuan University]

[Text] Abstract: High T_c Tl-Ba-Ca-Cu oxide superconducting ceramics without rare earth elements were prepared using low purity oxides of Tl, Ba, Ca, and Cu. Superconductors with nominal compositions of $TlBaCaCu_2O_y$ and $Tl_2Ba_2Ca_2Cu_3O_y$ were found to have a zero-resistance temperature of 121 K and a diamagnetic transition temperature of 122 K. The effects of preparation conditions on superconductivity and the formation of the superconducting phase are discussed.

I. Introduction

Ever since the discovery of high temperature oxide superconductors with transition temperatures in the liquid nitrogen range, exemplified by $YBa_2Cu_3O_{7-\delta}$, research of oxide superconductors became a hot topic; a number of high T_c oxides containing rare earth elements were reported. Because the prices of rare earth elements are high, researchers began to search for high T_c oxides that do not contain rare earth. Michel and Maeda[3] first produced the Bi-Sr-Ca-Cu-O superconducting system that contained no rare earth elements and the zero-resistance temperature was below that of liquid nitrogen. Chen Lichuan et al.[4] of the Chinese Academy of Sciences improved the preparation method and raised the zero-resistance temperature of Bi-Sr-Ca-Cu-O system to 84 K. Subsequently the Institute of Physics of the Chinese Academy of Sciences[5] produced Tl-Ba-Ca-Cu-O and achieved a zero-resistance temperature of 114 K, the highest at the time. Using low purity materials, we have produced high T_c superconductors with nominal compositions of $TlBaCaCu_2O_y$ and $Tl_2Ba_2Ca_2Cu_3O_y$ and a zero-resistance temperature of 121 K. In this paper we discuss the effects of sintering conditions on superconductivity and the formation of phases.

II. Experiments

The starting materials are Tl_2O_3 (about 85 percent pure), BaO (85 percent pure) or BaO_2 (85 percent pure), CaO (98 percent pure), and CuO (99 percent pure). The materials are mixed according to nominal compositions of $TlBaCaCu_2O_y$, $TlBaCaCu_3O_y$, $TlBaCaCuO_y$, and $Tl_2Ba_2Ca_2Cu_3O_y$, thoroughly ground and blended homogeneously and then cold pressed at 500 MPa. The pressed circular disks are placed on platinum or alumina plates and sintered in the atmosphere in a furnace. The sinter temperature is 740-860°C and the sintering time is 4 to 8 hours. The specimens are then cooled in the furnace to obtain the high T_c (superconducting transition temperature) materials.

Thermal analysis measurements are made on a Hungarian-made Derivalograph thermal analyzer. DTA and TG measurements are made on nominal $TlBaCaCu_2O_y$ mixture from room temperature to 1000°C. The sensitivity of the DTA experiments is 500 μV. The TG measurements have a sensitivity of 100 mg and the temperature ramp is 10°C/min.

X-ray diffraction analysis is carried out on different mixtures and ceramics made under different sintering conditions using a Japanese D/max-rA rotating anode X-ray diffractometer. The experiments' conditions are: Cu target, K_α line, 150 kV, and 180 mA.

The composition of the mixtures and the ceramics is also analyzed with energy dispersion spectroscopy of a scanning electron microscope.

The resistance of the samples is measured with a standard four-probe method. AC magnetization is measured with an induction method, and the errors in temperature measurements are less than 0.5 K.

III. Results and Discussion

Figure 1 shows the thermal analysis results of the mixtures. Two thermal absorption peaks are observed at 375°C and 460°C, accompanied by slight weight loss. Absorption peaks at 800, 823 and 870°C are accompanied by severe weight loss and the loss increases with heating temperature. Based on the thermal analysis results, we selected sintering temperatures. The relationships of superconductivity and sintering temperatures are listed in Table 1. During the experiments the specimens are kept at the specified temperatures for 8 hours. Results in Table 1 show that the range of sintering temperature for T_{co} (zero resistance temperature) of 99 K or higher is 740-860°C. At a sintering temperature of 740°C, thermal analysis traces already shows weight loss. Due to insufficient reaction at the low sintering temperature, T_{co} is only 99 K. At sintering temperatures of 790 and 800°C, DTA shows a small absorption peak but there is no serious weight or composition loss. More extensive reaction at these temperatures yields a T_{co} of 106 K. On samples sintered at 820-850°C, thermal analysis curves show severe weight loss even at 820°C, and more serious at 850°C. Samples sintered in this temperature range suffer severe composition loss, but in order to achieve more complete reaction, higher sintering temperatures are required. The conditions must therefore be controlled in such a way that

temperature rises rapidly so that Tl_2O_3 is quickly melted and undergoes solid-liquid reaction with other components to form stable phases. This would greatly reduce the loss of Tl during sintering and as a result yield superconducting ceramics with a T_{co} of 121 K. When the sintering temperature is further increased to 860°C, excessive compositional loss is detrimental to the formation of high T_c phases and the ceramics samples have a T_{co} of only 110 K.

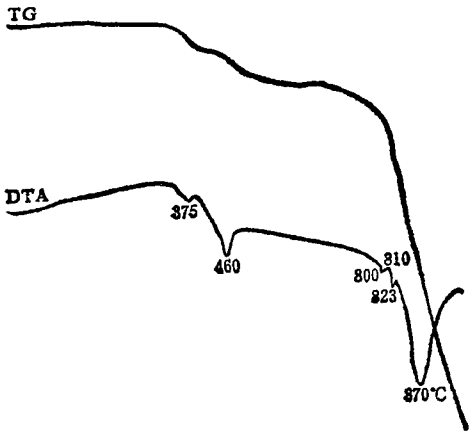

Figure 1. Thermal analysis curves of mixed materials of Tl_2O_3, BaO_2, CaO and CuO

Table 1. Relationships of Superconductivity and Sintering Temperatures of $TlBaCaCu_2O_y$ Ceramics

T_{Sin}(°C)	740	780	790	800	820-850	860
T_c^{on}(K)	111	113	125	125	132	127
T_{co}(K)	99	102	106	106	121	110

Specimens with T_{co} higher than 106 K are obtained by sintering the materials at 790-860°C for 4-8 hours. When disks formed after pre-sintering at 780°C for 8 hours and disks formed directly from the mixture are sintered together in the same furnace for 8 hours at 800°C, the former will have a T_{co} 5-10 K lower. This indicates that re-sintering is harmful to the superconductivity of the ceramic system. The former is sintered too long and suffers excessive composition loss, which leads to a decrease in T_{co}.

When BaO or BaO_2 is replaced by $BaCO_3$ and CaO is replaced by $CaCO_3$, that is, when Tl_2O_3, $BaCO_3$, $CaCO_3$ and CuO are mixed together, thermal analysis curves show that the pre-reaction is not complete until 890°C. When the mixture is heated at 890°C, formed into shape, and then sintered at 780-850°C, the resulting sample is an insulator at room temperature and its resistance does not drop to zero at liquid nitrogen temperature. When a mixture containing carbonates is formed directly and sintered at 780-850°C, it does not produce ceramics. It appears that the dissociation of carbonates is not favorable to

the formation of superconducting phase. Oxides, namely Tl_2O_3, BaO, BaO_2, CaO, and CuO, should therefore be used in the preparation of high T_c superconducting ceramics.

X-ray energy spectral analysis of Tl, Ba, Ca and Cu contents in $TlBaCaCu_2O_y$ sintered at different temperatures for different lengths of time shows different amounts of Tl loss. The loss is greater for higher sintering temperatures and longer sintering time. The weight loss in the thermal analysis curves is mainly due to the loss of Tl.

Figure 2 shows that the X-ray diffraction spectra over an angular range of 10-70° of ceramics sintered under different conditions. These results show that the sample is superconducting whenever new diffraction spectral lines in addition to those in the starting material appear at 2θ = 27.6°, 31.4°, 32.8°, 33.3° and 36.8°. These spectral lines are therefore regarded as spectral lines of the superconducting phases. For samples with T_{co} of 110 K and 121 K, there is another line at 32.2° and the strength of this line is great for the 121 K sample. This spectral line appears to be related to the occurrence of the high T_c of 121 K. The sample sintered at 740°C has a T_{co} of 99 K and it shows diffraction lines of CuO, CaO and $BaCO_3$ in addition to the superconducting spectral lines. The sample sintered at 800°C has a T_{co} of 106 K. It shows five strong superconducting phase spectral lines and CuO and $BaCO_3$ lines. The sample sintered in the 820-850°C range has a T_{co} of 121 K and its major spectral lines can be indexed according to the tetragonal structure of a = 5.46 Å and c = 36.2 Å, indicating that the sample is approaching a single phase structure. X-ray energy spectral analysis of 20 randomly selected grains on this sample shows that elemental composition within the grains is basically the same, which also indicates that the sample is approaching a single phase structure. The sample sintered at 860°C has a T_{co} of 110 K and three spectral lines due to superconducting phases, but the lines at 27.6° and 31.4° have disappeared. The spectral line at 32.2° associated with the 121 K superconducting phase is still there. The spectrum also contains lines of CuO, CaO and $BaCuO_2$. The $BaCuO_2$ line at 29.2° is very strong. Diffraction spectrum of the sample sintered at 900°C shows that the major phase of this sample is $BaCuO_2$. At this sintering temperature severe loss of Tl makes the sample an insulator at room temperature and destroys the superconductivity. X-ray diffraction results show that too high a sintering temperature can lead to the appearance of $BaCuO_2$ phase and the higher the sintering temperature, the greater the $BaCuO_2$ phase. We believe that at this sintering temperature the severe loss of Tl leads to a Cu-rich and Ba-rich conditions and hence the formation of $BaCuO_2$. Spectral curves also show that un-reacted CuO exists in all samples. Some also have CaO. This shows that composition ratio and sintering conditions can be further improved.

Samples with nominal composition of $TlBaCaCuO_y$ and $TlBaCaCu_3O_y$ and sintered at 790-850°C for 4-8 hours are still superconductors with T_{co} greater than 100 K. Under favorable conditions, ceramics with a nominal composition of $Tl_2Ba_2Ca_2Cu_3O_y$ can still have a T_{co} of 121 K. Figure 3 shows the temperature dependence of electromagnetic properties of a Tl-Ba-Ca-Cu oxide superconductor that has a zero resistance temperature of 121 K and an onset of diamagnetic

transition at 122 K. Experiments show that the 120 K superconducting phase is formed according to the intrinsic atomic ratio and is not determined directly by the nominal composition. Samples prepared with different nominal composition have different amounts of impurities. The fact that we can produce high T_c superconductors with low purity materials indicates that the formation of the superconductor phase in this system is not very sensitive to impurities.

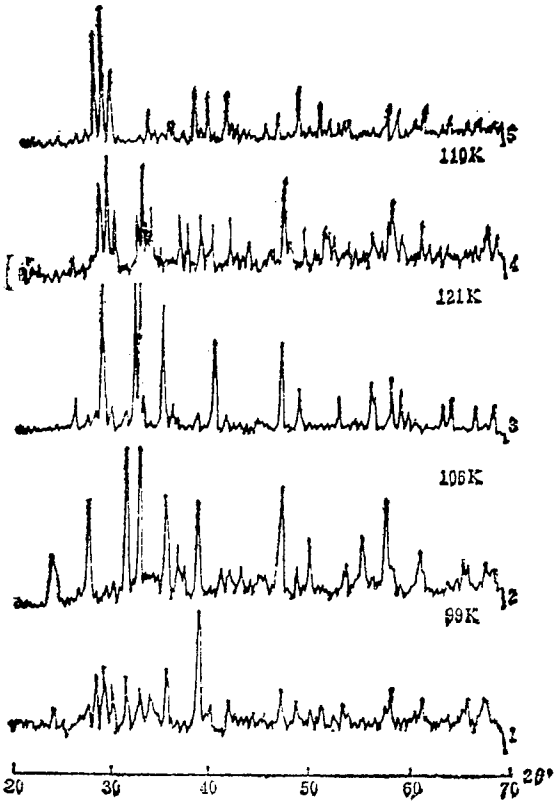

Figure 2. XRD patterns of the ceramic samples at different sintering temperatures.
1--Sintered at 740°C;
2--Sintered at 800°C;
3--Sintered in the range of 820°C to 850°C;
4--Sintered at 860°C;
5--Sintered at 900°C, nonsuperconductivity.

After the samples are stored in air for a long time, they become rather porous and crumble under force. This is the result of slow deliquescence in air. We have also soaked 100 K samples in water for 15 hours and then baked them dry. These samples lost their superconductivity and X-ray diffraction shows that all the spectral lines associated with superconductivity have disappeared. This showed that such samples hydrolyze in water.

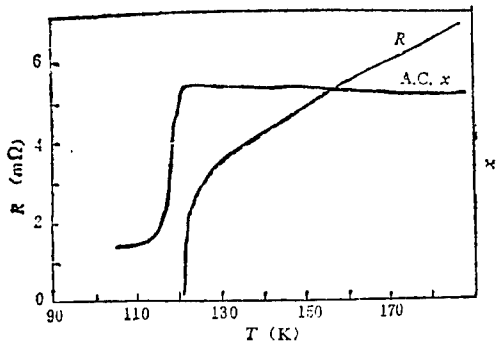

Figure 3. Temperature dependence of resistances and A.C. magnetic susceptibility of the 121 K superconductor $TlBaCaCu_2O_y$

IV. Conclusion

Under the appropriate preparation conditions, Tl-Ba-Ca-Cu oxide superconducting ceramics without rare earth elements can be reliably produced. T_{co} is 121 K and diamagnetic T_c^{on} is 122 K. X-ray diffraction results show that the ceramics is close to a single phase structure. We think that superconducting ceramics with even higher T_c can be produced by improving the purity of the materials and by optimizing the composition and process.

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HVBL System, "Compatible Transition" Approach to Development of Coming Generation TV

40080111 Tianjin TIANJIN DAXUE XUEBAO [JOURNAL OF TIANJIN UNIVERSITY] in Chinese No 3, Nov 88 pp 33-40

[Article by Li Hua [2621 5478] and Yu Sile [0205 2448 2867] of the Electronic Engineering Department, Tianjin University: "Research on a 'Compatible Transition' Approach to Developing a New Generation of Television and the HVBL System"; manuscript received 6 Apr 87, revised draft received 27 Mar 88; project funded by the National Natural Science Foundation]

[Text] Abstract

This article describes shortcomings of existing TV systems. An overview of several new generation TV systems is the foundation for proposing an HVBL [High Video Bandwidth Line-Return] system and "compatible transition" approach for coordinated development of terrestrial transmission and satellite broadcasting. The HVBL system, with increased resolution and expanded aspect ratio, is also fully compatible with the PAL/D system.

Key words: Color television system; high-definition television; resolution; aspect ratio; compatibility

I. Shortcomings of Existing Television Systems

The growth of the information society and higher popular audience demand have now placed television in a process of transition to a new generation of TV. Demand is not being met by the three types of color TV systems which first came into use 20 to 30 years ago.[1] A problem common to all three is shortcomings arising from the composite signal method and interlaced scanning method.

The composite signal transmission method, which transmits luminance and color on the same frequency band, places a narrow-band chrominance signal frequency spectrum at the high end of the luminance signal frequency spectrum, resulting in luminance and chrominance crosstalk, low color horizontal resolution, rather poor color signal/noise ratios in FM satellite transmission, and other shortcomings. Defects arising from the interlaced scanning method are illustrated in Figure 1. The diagram shows the distribution of the image

frequency spectrum on the f_y and f_t planes using a 625/50/2:1 scanning method. The corresponding two-dimensional Fourier transformation can be expressed as

$$B_{v,t}(f_v, f_t) = \frac{1}{4Td} \sum_{i=-\infty}^{\infty} \sum_{j=-\infty}^{\infty} B\left(f_v - \frac{i}{2d}, f_t - \frac{j}{2T}\right)\left[1+(-1)^{i+j}\right] \quad (1)$$

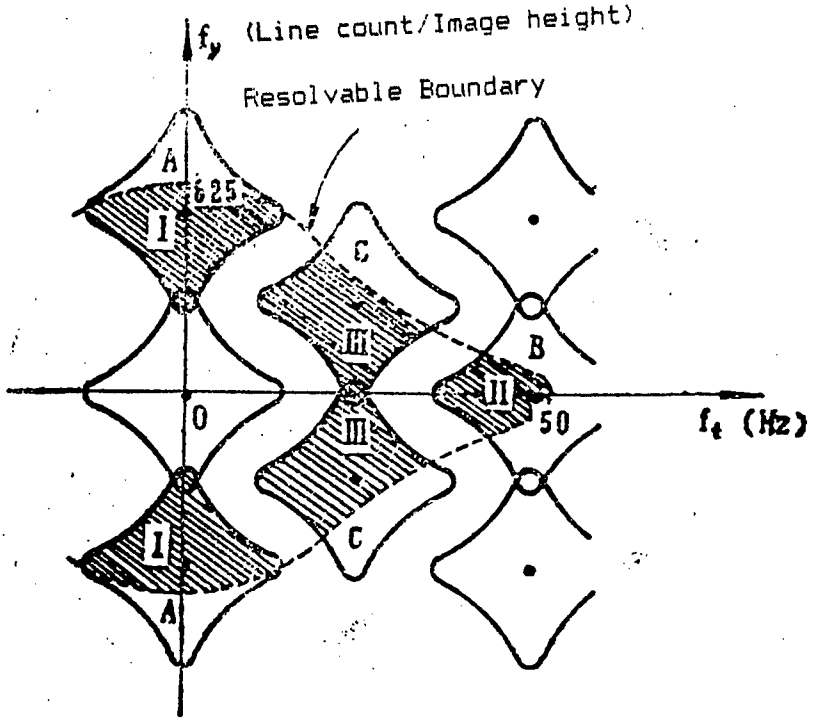

Figure 1. Frequency Distribution of Interlaced Scanning Television Image Signals on f_y and f_t Planes

In the formula, $B(f_y, f_t)$ is the baseband spectrum, d is the line spacing, and T is the field interval. The "resolvable boundary" is described in terms of the temporal and spatial resolution capabilities of the human eye. The interference component causes line structure and line overlap in region I, 50 Hz large area flicker in region II, and line creep and line flicker (interlacing effects) in region III. The result is picture instability, impurity, and reduced vertical resolution (leading to a Kell coefficient of less than 1).[2,3]

II. Progress in Research on New Generation TV Systems

Research on new-generation TV systems to overcome shortcomings in existing TV systems began in the late 1960's. High-Definition Television (HDTV) systems[4-7] were the earliest research goal. A representative system is the 1125-line system studied by Japan's NHK.

The basic parameters for this system which were submitted as a unified world standard to the 16th Plenary Session of the 1986 International Radio Consultative Committee (CCIR) are shown in Table 1. This system has pleasing image quality, but the main problems are an overly-broad frequency band width and incompatibility with existing TV systems. There also is a field frequency conversion problem in countries which use a 50-Hz field frequency, so this proposal was not accepted.

Table 1. Proposed HDTV Studio Standards

Scanning line count	1125	Scanning method	2 : 1 Interlacing
Effective line count	1035	Aspect ratio	16 : 9
Field frequency	60.00Hz	Effective line sampling count	Luminance 1920, Chrominance 960

Following the development of digital signal processing technologies and VLSI [very-large-scale integrated circuits] technologies, Professor Wendland of West Germany's Dortmund University began with the concept of using different signal source and display standards and transmission standards in studying a high-quality TV method employing a high-scanning-frequency signal source and identical transmission standards.[2][3][8][9] This method effectively improves vertical and horizontal resolution and can eliminate interlacing effects, large area flicker, and other phenomena. Its main advantage is compatibility with existing TV systems. Because of frequency restrictions, however, it cannot fully attain HDTV quality indices. Several other systems also belong to this compatible category.[10-12] Among them, the SLSC (Split-Luminance, Split-Chrominance) system is a dual-channel system. It uses an HDTV signal source, signal processing techniques, and frequency-division and time-division multiplexing techniques to form a compatible NTSC [National Television System Committee] signal which is transmitted on the lower channel. An auxiliary signal for increased resolution and aspect ratio is transmitted on the upper channel. This type of system can double (600 lines) the actual horizontal resolution and provide more than one-half additional vertical resolution (483 lines) in the current NTSC system, with an aspect ratio of 5:3.

Direct broadcast satellites (DBS) are a new means for TV broadcasting. In consideration of the use of FM methods and the impossibility of direct compatibility, England's Independent Broadcasting Authority (IBA) proposed the MAC system (Multiplexed Analog Component System)[13][14] which maintains identical scanning standards while using an analog component time-division multiplexing system. It can effectively overcome crosstalk between the various signal components and improve the color signal/noise ratio. On this foundation, there can be greater use of the favorable conditions of rather wide satellite channel frequency bands (because there is no chrominance subcarrier wave in the MAC system, the video frequency signal bandwidth in 27 MHz bandwidth channels can be expanded to 12 MHz), and high-scanning-frequency signal sources and signal-processing techniques can be employed. This also can enable gradual development into an HD-MAC system which can be transmitted at satellite frequencies and attain HDTV quality requirements.[15] In another area, the use of signal-processing techniques to compress the bandwidth of a high-line-count HDTV system could enable transmission on a single satellite channel, as in the MUSE system (Multiple Sub-Nyquist Sample Encoding).[16]

It is apparent that research on new-generation TV systems will be rather lively over the next 10-plus years. Several different systems have been proposed for different stages of technical development, different foundations of material conditions, and emphasizing solutions of different problems. Each has its advantages in resolution, image quality, transmission bandwidth, compatibility, hardware implementation, economics, and other areas. There is now extreme controversy internationally regarding formulation of a single world standard for HDTV studios.[17][18] Thus, integration with a specific country's national conditions, formulation of development approaches, and research on new-generation TV systems naturally has become extremely important work.

III. A "Compatible Transition" To Develop a New-Generation TV

A. Choosing the "compatible transition" development approach

As mentioned previously, the various systems already studied can be divided into the two main categories of compatible and non-compatible methods, while the former category can be divided into fully compatible and partially compatible. Any system has scanning standards, RF transmission standards, video-frequency signal coding methods, and other characteristics. Thus, a fully compatible system refers to broadcasting TV signals which are similar in these areas to existing TV systems (including high-quality TV systems, compatible channel SLSC systems, and so on). Partially compatible systems are similar only in some areas (the identical scanning standards in the MAC system, for example). Non-compatible systems are completely different (high-line-count HDTV systems, for example).

Considering these factors, it would be best for China to adopt a "compatible transition" approach in developing a new generation TV:

1. Excessive investments are required for a non-compatible complete transformation, which is inappropriate given China's present national economic capacity and the inadequate purchasing power of most households.

2. We already have a terrestrial coverage network which cannot transmit the frequency bandwidth of standard frequency HDTV-system TV signals. The first thing to do after setting up satellite broadcast TV is to increase the coverage rate and use it for TV educational programs; more frequencies cannot therefore be provided for broadband HDTV programs.

3. Direct broadcasting and individual reception of satellite TV will not be possible in the foreseeable future, so household reception must still be done via terrestrial transmission and broadcast networks. Thus, measures for compatible improvement of terrestrial network TV quality are essential to achieve high-quality satellite transmission.

4. The standard video frequency bandwidth of the PAL/D system is 6 MHz, providing enormous potential for using signal processing techniques to improve TV quality. Moreover, the birth of commercial digital receivers also indicates that material conditions needed to achieve this method are becoming increasingly mature.

B. Compatible development of terrestrial transmission networks

Compatible transition development includes the two areas of terrestrial transmission networks and satellite transmission. The first area can be developed in two stages using fully compatible methods. The first steps can achieve compatible improvement of image quality in existing TV systems based on principles shown in Figure 2. A high-scanning-frequency signal source is used at the transmission end. After prefiltering and down-conversion, a high-quality signal without overlapping is formed using current transmission standards. When received by a conventional TV (labeled CTV in the figure), an improved-quality image can be displayed. When received by a new High Quality Television (HQTV) set, prefiltering, up-conversion, and restoration provide a high-scanning-frequency display with an obvious improvement in image quality.

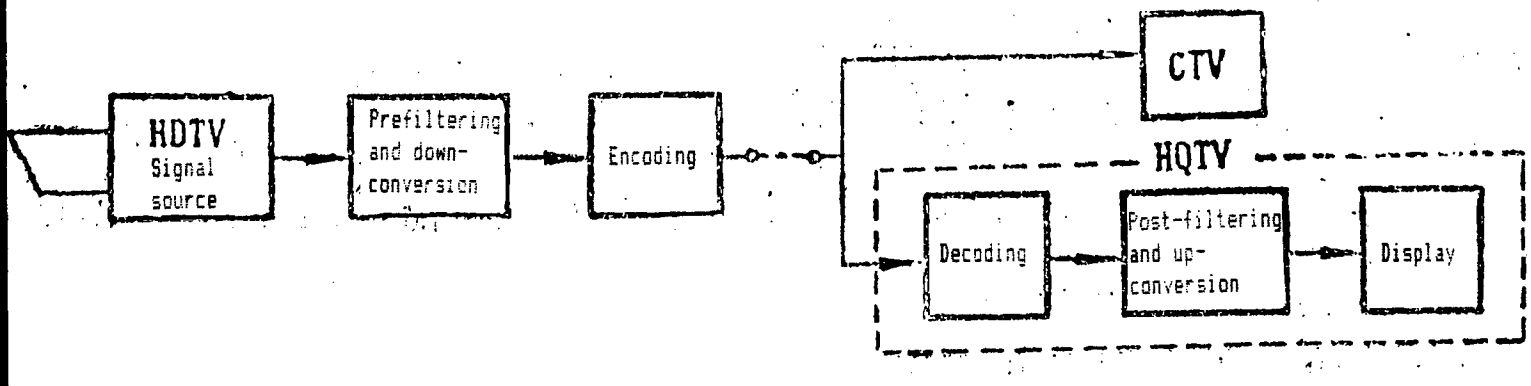

Figure 2. Compatible Improvement of Image Quality in Present Television System

Elimination of the effects of frequency spectrum overlap on vertical resolution increases the Kell coefficient to almost 1. Thus, vertical resolution can be doubled (or better), about 550 lines. The relevant research[13] has shown that adoption of an oblique filtering method makes full use of spatial slots in the two-dimensional frequency spectrum in the existing channel bandwidth and can increase horizontal resolution by a maximum of 100 percent, with reduced oblique resolution. To assure no obvious reduction in the latter, and in consideration of the 6 MHz standard video frequency bandwidth used in China, filter characteristics can be designed for a one-half increase. This can increase the actual horizontal resolution to the equivalent of a 9 MHz bandwidth, or about 700 lines. Research results have already confirmed this.[19]

The second stage can achieve a broad aspect ratio and additional quality improvement. To increase the aspect ratio, a frame edge signal can be transmitted outside the central part of the picture for compatible reception. Figures 3 to 6 provide a brief introduction to the HVBL system program studied by the authors. It is capable of fully utilizing the D system 6 MHz video bandwidth and surplus time in the line field return interval.

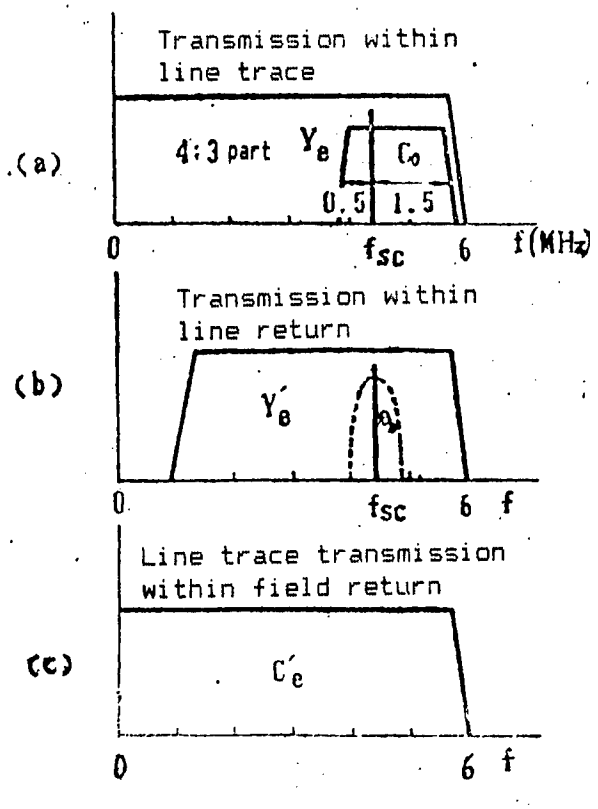

Figure 3. Frequency Spectrum Configuration of HVBL System

Figure 3 shows its frequency spectrum configuration. Figure 3(a) is the compatible image signal frequency spectrum. The color difference signal bandwidth here is expanded to 1.5 MHz, while the sideband of the chrominance signal occupies only 0.5 MHz. This helps to increase color horizontal resolution without increasing luminance-chrominance crosstalk in conventional televisions.

To increase the aspect ratio, the line and field blanking time is used to transmit the frame edge information. The edge luminance signal Y_e occupies a 4.6 MHz bandwidth, and after modulation occupies a (1-6) MHz frequency band. It is transmitted by interleaving it with the color synchronization signal frequency spectrum during the line return period, as shown in Figure 3(b). After line-by-line alternating processing and 4:1 compression along the time axis, the 1.5 MHz bandwidth edge color difference signals U_e and V_e, occupy a 6 MHz bandwidth and are transmitted in 15 lines during the field return period, as shown in Figure 3(c). Figure 4 shows the video frequency signals and the gate signals which control separation transmission. Figure 4(a) shows that after source prefiltering and down-conversion processing, the HDTV signal provides a video frequency signal with a 5:3 aspect ratio, a 52 μs trace, and a 7.5 MHz bandwidth. After 5/4 expansion it forms a compatible video frequency signal with a 4:3 aspect ratio, a 52 μs trace, and a 6 MHz bandwidth. The left and right edge signals which take up one-fifth of the trace are selected from the G_e gate signals. The right edge signal is given a suitable delay and transmitted together with the left edge signal during the return interval. The gate signals which control the compatible signals are, respectively, Q and $\overline{Q}$.

Figure 5 is a block diagram of the encoder. Encoding of the compatible image signals is done in the path in the lower part. Signal expansion can be done using CCD-type [charge-coupled device] components. The paths in the middle and upper parts encode, respectively, the luminance edge signals and color difference edge signals. The 1H delay line is designed to delay the horizontal signals during expansion processing. Figure 6 is a block diagram of the decoder, which performs the reverse process of the encoder. The Y, U, and V signals undergo post filtering and up-conversion processing after restoration, achieving an image display with a wide aspect ratio and high resolution.

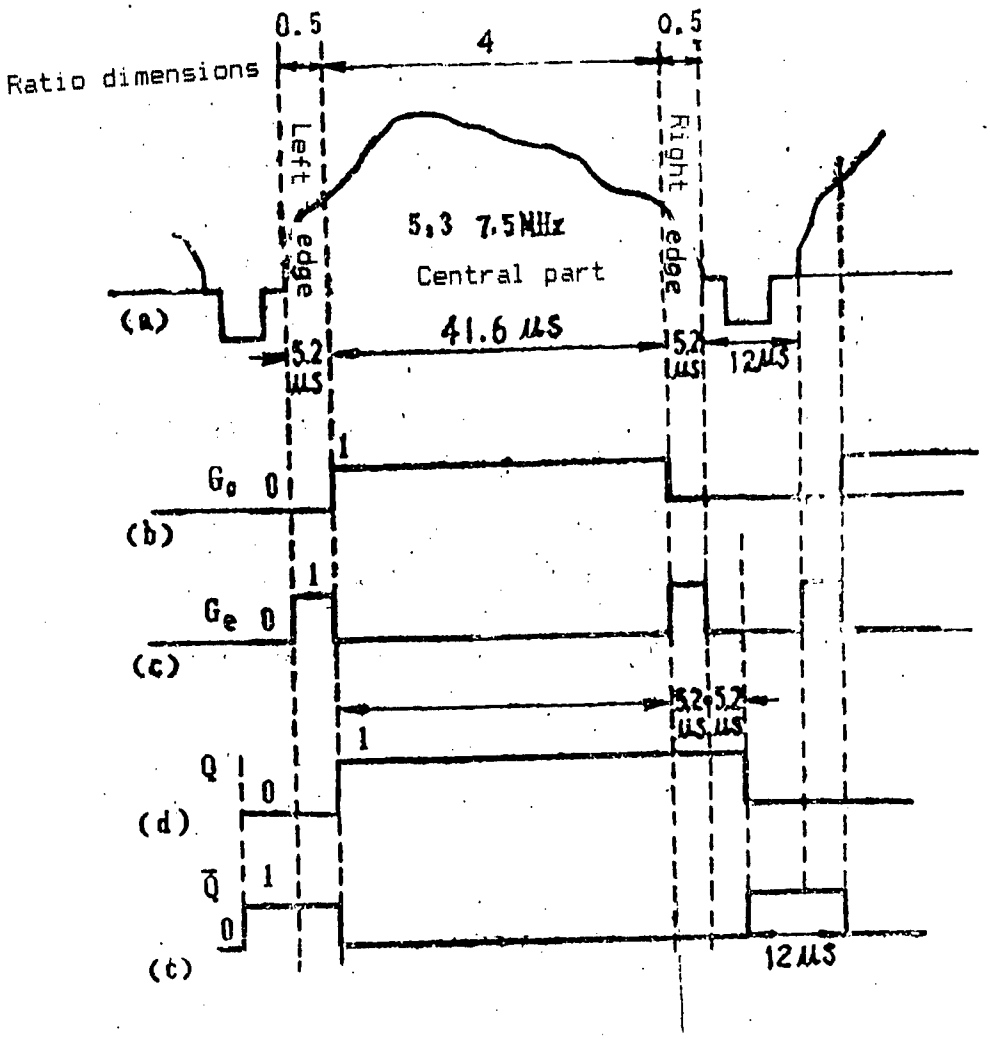

Figure 4. Video Frequency Signals and Control Gate Signals in HVBL System

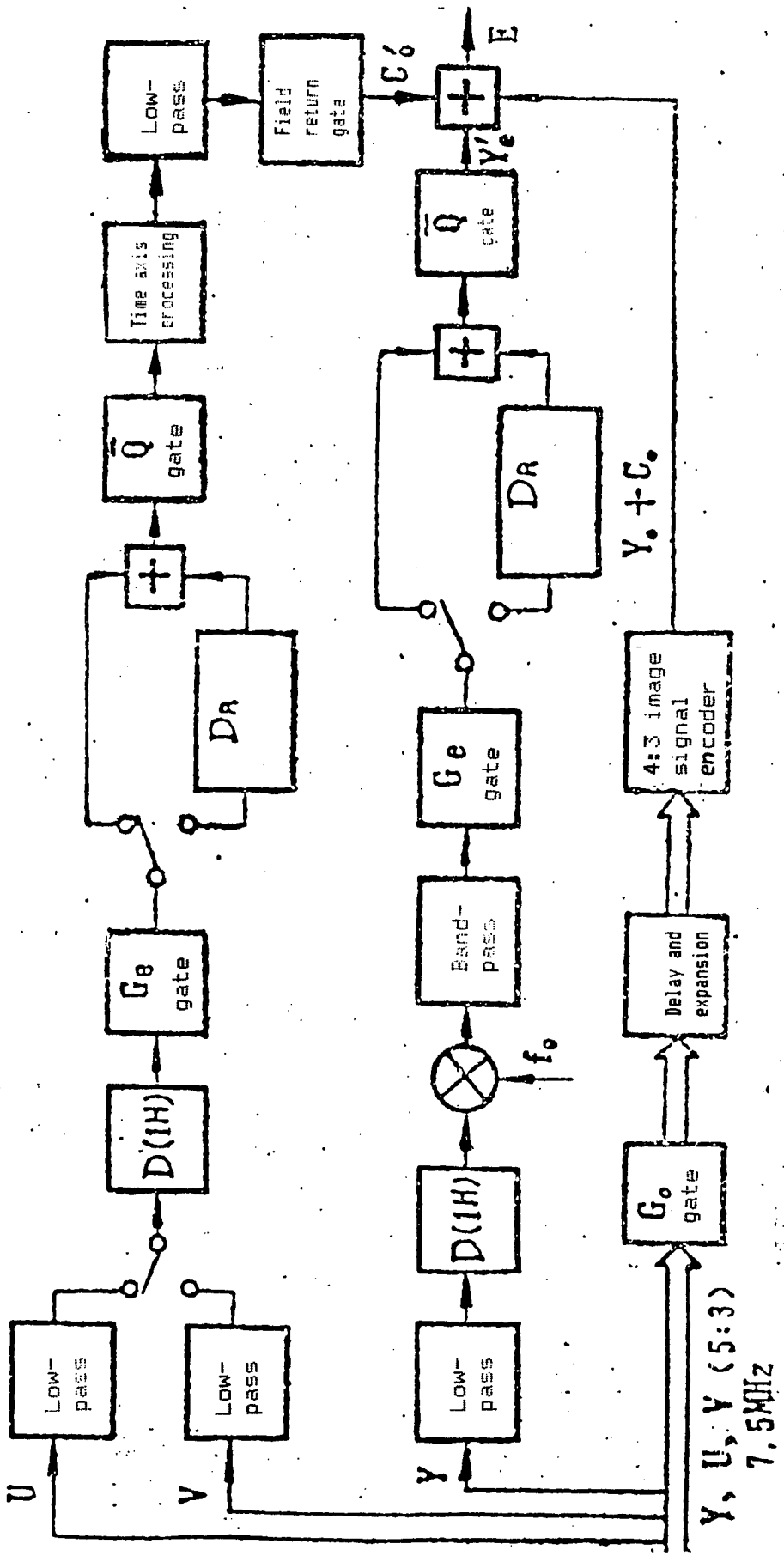

Figure 5. HVBL System Encoder

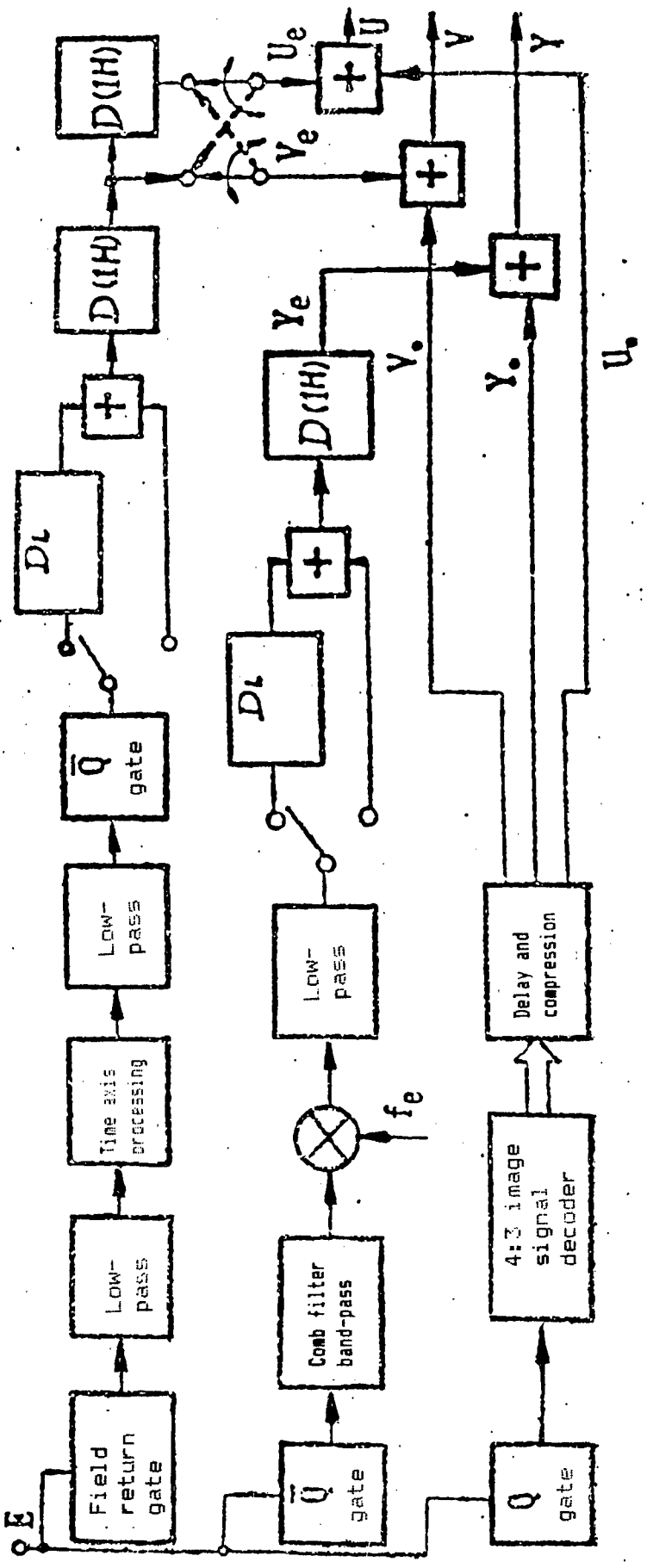

Figure 6. HVBL System Decoder

Because this program eliminates frequency spectrum overlapping, it can increase vertical resolution almost to the effective scanning line count, whereas horizontal resolution can be increased by one-half (based on signal bandwidth) depending on the characteristics of the oblique filter chosen. Again, considering that the aspect ratio is 5:3 and that the various signal components undergo different processing during encoding, the resolution (line count) attainable in this program is roughly as follows:

Table 2. HVBL System Resolution

	Central part of picture		Picture edges	
	Horizontal	Vertical	Horizontal	Vertical
Luminance	700	550	440	550
Color difference	180	550	140	280

If we permit an additional reduction in the horizontal resolution of the edges, the aspect ratio can be increased more.

It should be pointed out that certain types of additional interference appear because of insufficiently adaptable circuits actually employed in existing receivers when using this compatible system. Thus, attention should be given to standardizing of receiver circuit designs during the first stage. If we wish to avoid this situation, we can study a program for a fully compatible system which also can be fully adapted to existing receiver circuits. For example, there can be a slight expansion in the field return interval to increase the information transmission capacity. This would cause an obvious reduction in the line return interval occupied by the additional information transmitted and prevent interference with the synchronization signals. Because elimination of frequency spectrum overlapping plays an obvious role in increasing vertical resolution, there is a slight reduction in the effective scanning line count which does not affect the overall improvement in vertical resolution.

In addition, high-quality decoders based on digital technologies can be used. Examples include using digital filtering techniques to reduce crosstalk between luminance and chrominance signal components, digital two-dimensional aperture equalization, adaptive noise blanking, automatic ghost compensation, and so on, for additional picture quality improvement. This can more or less attain HDTV display quality.

The two compatible development stages for the terrestrial transmission network are shown in the upper half of Figure 7.

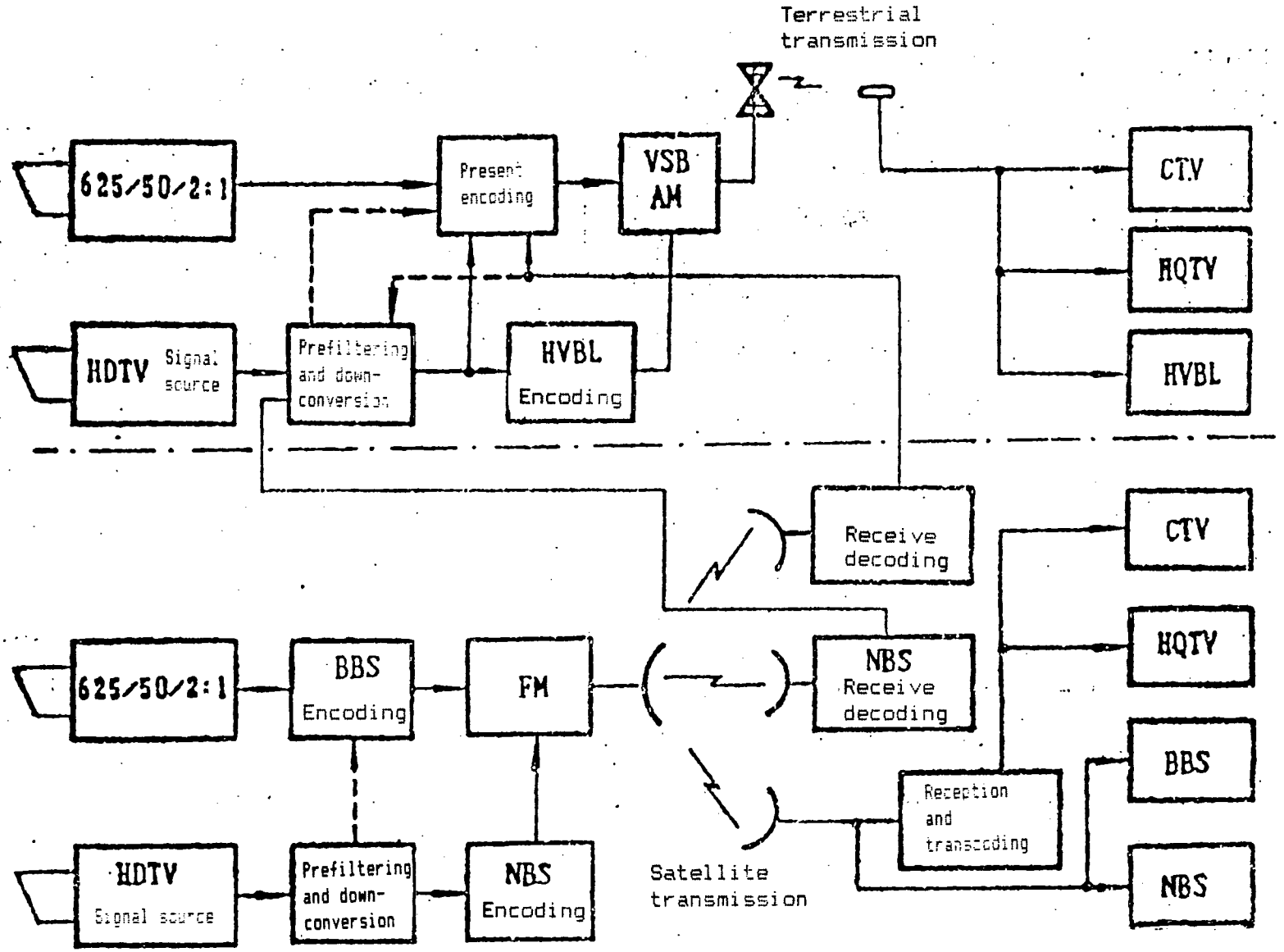

Figure 7. Explanation of "Compatible Transition" Development of New-Generation TV

C. Compatible development of satellite television

For satellite transmission, it would be more rational to have a partially compatible system using identical scanning standards to facilitate interfacing with terrestrial networks and produce cheap, high-performance transcoders compatible with existing receivers. For example, a system with excellent transmission properties on FM satellite channels (such as the MAC system) can be chosen as the basic system (labeled BBS in Figure 7). It also would be suitable for use when terrestrial networks enter the first development stage. As technical and economic conditions mature and terrestrial networks enter the second development stage, a new satellite TV system which can make full use of satellite transmission bandwidth characteristics and employ signal processing techniques to attain HDTV goals cal be introduced (such as the HD-MAC system).[15] It would be compatible with the basic system (labeled the NBS system in Figure 7). In this manner, there would be an exact matchup between quality improvement in satellites and terrestrial networks. Besides being received and decoded in terrestrial transmission networks for viewing by general audiences, signals transmitted by satellites also could be received directly by special receiving stations. To achieve this, CTV and HQTV receivers would have to be outfitted with transcoders or the ground station would have to be converted to satellite system receivers. In this way, when DBS TV is achieved, household televisions also can shift to HDTV.

The step-by-step development of satellite broadcasts employing partial compatibility methods and their inter-matchup with terrestrial networks is shown in Figure 7.

IV. Conclusion

This article studied a "compatible transition" approach for developing a new generation of TV. It involves stage-by-stage development in the two areas of terrestrial transmission networks and satellite broadcasting, as well as the matchup between them. The characteristics of this type of "compatible transition" method are based on technical and economic feasibility, gradual development, gradual benefits, and eventual achievement of HDTV goals. Although there could be a significant improvement in image quality with an incompatible complete transformation, it would not really be feasible and would instead delay progress in developing a new-generation TV.

To achieve a fully compatible transition in terrestrial transmission networks, the authors studied and proposed the high-resolution, wide-aspect-ratio HVBL system (this article introduced one program for it). It makes full use of existing TV channels, is based on digital signal processing techniques and digital receiver technologies, and can exploit to the greatest possible degree the potential in D and K system TV standards, achieving an enormous reduction in the difference between household TV image quality and HDTV. Research on this type of system and the relevant experimental work to examine and confirm it will require further development.

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Interference Phenomenon on Three-Grating System

40090044a Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 1, Jan 89 pp 35-43

[English abstract of article by Liu Liren [0491 4539 0086] of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] In this paper, the interference phenomenon in an optical system with three gratings in series arrangement is proposed and analyzed in terms of the partial coherence theory and the ambiguity function. As a result, the fringe intensity distribution is derived as a joint convolution-correlation integral of three equivalent functions of gratings. The conditions involving the distances and the period ratios between gratings are studied. With the change in the slit width, the Talbot effect, the partially coherent effect and the Lau effect can be observed in sequence. The profile of partially coherent fringes varies with the relative shift of any grating. Finally, experimental verifications for theoretical predictions are given.

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Difference in Doping Effects Between $YBa_2Cu_{3-x}Co_xO_y$, $YBa_2Cu_{3-x}Zn_xO_y$

40090044b Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 1, Jan 89 pp 60-67

[English abstract of article by He Zhenhui [0149 2182 6540], et al., of the Department of Physics, University of Science and Technology of China, Hefei; Chen Zuyao [7115 4371 5069], et al., of the Department of Applied Chemistry, University of Science and Technology of China, Hefei]

[Text] The measurements of X-ray diffraction, dc resistance versus temperature and Hall coefficients at low temperatures have been performed for $YBa_2Cu_{3-x}M_xO_y$ systems (x = 0.00, 0.025, 0.05, 0.075, 0.10, 0.125, 0.15, 0.20, 0.25, 0.275, 0.30, 0.325, 0.35, 0.375, 0.40 for M = Co; x = 0.025, 0.05, 0.075, 0.10, 0.15, 0.20, 0.30 for M = Zn). The crystallographic data show that an orthorhombic-tetragonal phase transition takes place as the Co content increases, while the crystal structure exhibits drastic changes with the Zn content. The measurement of resistances indicates that a metal-semiconductor transition occurs at certain values of x for the Co dopant, but is not found for the Zn dopant. The hole carrier concentration decreases with the Co content monotonously, but varies nonmonotonously with the Zn content, reaching a maximum at about x = 0.15. The concepts of localization and acceptor are used to explain these phenomena. The suppression of T_c for both systems is discussed for several possible suppression mechanisms.

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Study of Breakdown Mechanism of Thin $Si_xO_yN_z$ Film

40090044c Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 1, Jan 89 pp 68-75

[English abstract of article by Chen Dounan [7115 2435 0589], et al., of the Department of Physics, South China University of Technology, Guangzhou]

[Text] The breakdown characteristics of very thin nitrided silicon oxide film have been examined. The breakdown mechanism of this film and the factors affecting the breakdown characteristics have been explored. It has been found that the improvement of the breakdown properties of this nitrided oxide depend greatly on changes in the film's microstructure and interface, as well as the composition of the film. The narrowing of the film's band gap width after nitridation makes the electric field for intrinsic breakdown decrease, but the occurrence of the breakdown may be greatly postponed by dense material, a smoothed interface and the effect of traps. Experimental evidence confirms that impact-ionization exists in the intrinsic type of breakdown, but the permanent breakdown is caused by heat transfer in all cases.

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Anomalous Ion Channeling Effects in InGaAs/GaAs Strained Heterojunctions

40090044d Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 1, Jan 89 pp 83-90

[English abstract of article by Wu Chunwu [0702 2504 2976], et al., of the Institute of Semiconductors, Chinese Academy of Sciences; Liu Jiarui [0491 1367 3843], et al., of the Institute of Physics, Chinese Academy of Sciences]

[Text] The 5.8, 3.0 and 1.2 MeV Li ions were used to study the MBE $In_{0.25}Ga_{0.75}As/GaAs$ (100) sample. Ion channeling angular scans about the [100] and [110] axes were carried out in the (100) plane.

It was found that in the case of 5.8 MeV, the critical angle of the epilayer was almost the same as that of the substrate, and the angle misalignment between them was 0.90° for axis [110], corresponding to the sample misfit of 1.62 percent, and is in good agreement with the theoretical calculation. In the 3.0 MeV case, serious asymmetry was observed in the RBS/channeling angular scan, while in the 1.2 MeV case, the angular misalignment was reduced to 0.50° and the critical channeling angle of the substrate increased significantly. The authors have studied and discussed the physical mechanisms of these anomalous phenomena in detail, and present a good interpretation of the experimental results.

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Anelastic Relaxation with Infrared Divergence Superionic Glasses

40090044e Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 1, Jan 89 pp 134-139

[English abstract of article by Ding Yi [0002 1473], et al., of the Department of Physics, University of Science and Technology of China, Hefei; Wu Kunyu [0702 2492 5940] of the Department of Radio and Electronics, University of Science and Technology of China, Hefei]

[Text] Based on the characteristic of superionic glasses and the infrared divergence response theory, the authors studied the anelastic relaxation of amorphous superionic conductors. The authors believe that the ultrasonic attenuation of superionic glasses is due to the thermal active relaxation process of mobile superions bonded weakly to the glassy network and the accompanying low energy excitation dissipation.

The theory can explain the experimental characteristics which failed to be interpreted by previous theory using distributed relaxation times. The authors' predictions agree well with the available experimental data.

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Dielectric Properties of Bis-(p-Toluene Sulphonate) of 2,4-Hexadiyne-1,6-Dial (TS), Effect of Solid State Polymerization

40090044f Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 1, Jan 89 pp 149-153

[English abstract of article by Ruan Yaozhong [7086 5069 6988], et al., of the Department of Physics, University of Science and Technology of China, Hefei; He Pingsheng [0149 1627 4563], et al., of the Department of Material Science and Engineering, University of Science and Technology of China, Hefei]

[Text] The temperature dependence of the dielectric constant of the monomer single crystal TS has been determined for the range from 77 to 300 K, with two anomalies having been observed near 160 K and 203 K. The variation of the dielectric constant of TS during thermal solid state polymerization is obtained. In the initial stage of polymerization, the dielectric constant decreases slowly, while when the sample conversion to a polymer exceeds 30 percent, the dielectric constant increases rapidly. The authors suggest that this behavior may be related to the side-group and π-electron, thereby explaining the results qualitatively.

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Gap States Due to Intrinsic Defects in a-Si:H

40090044g Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 38 No 1, Jan 89 pp 163-169

[English abstract of article by Zhang Ruiqin [1728 3843 0530], et al., of the Department of Physics, Shandong University, Jinan; Guan Daren [7070 1129 0117], et al., of the Institute of Theoretical Chemistry, Shandong University, Jinan]

[Text] Calculations for electronic structures of Si_{20} and Si_{47} clusters cut from continuous random networks of a-Si, as well as those of the simple Si_8H_{18}, Si_{17}, have been performed using the CNDO LCAO MO method. The origin and nature of the gap states due to intrinsic defects such as weak bonds, bent bonds and charged configurations have been examined in a-Si:H. The results show that two weak bond states situated on both sides of the band gap contracted and shifted to the center of the gap as the weak bond stretched. These weak bond levels were shifted nearer to the top of the valence band or the bottom of the conduction band due to extra charges. The bent bond states mainly appear near the top of the valence band. When the bond was bent severely, the bond level shifted upward, close to the center of the band gap. The structural topological disorder may induce the gap states at any position within the band gap. It is suggested that all weak bonds and bent bonds, as well as charged configurations, are the principal forms of intrinsic defects in a-Si:H. Experimental results of gap states are explained according to these theoretical calculations.

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Possibility of Existence of New Isotope ^{65}Se

40090045a Beijing GAONENG WULI YU HE WULI [HIGH ENERGY PHYSICS AND NUCLEAR PHYSICS] in Chinese Vol 13 No 2, Feb 89 pp 156-163

[English abstract of article by Xu Xiaoji [1776 2556 0370] of the Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou]

[Text] A new beta-delayed proton precursor of ^{65}Se was probably produced via the reaction $^{40}Ca(^{28}Si, 3n)^{65}Se$ and has been identified from its beta-delayed proton emission. A single proton group at 3.75 ± 0.05 MeV with a half-life of $10.8 \pm \frac{4}{3}:\frac{1}{7}$ ms was observed, corresponding to the superallowed beta decay of ^{65}Se to the isobaric analog state of ^{65}As (the lowest T = 3/2 state in ^{65}As), then proton emitting to the ground state of ^{64}Ge. Due to poor statistics, further experimental efforts are required to confirm this discovery.

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Effect of Nuclear Viscosity on Fission Process

40090045b Beijing GAONENG WULI YU HE WULI [HIGH ENERGY PHYSICS AND NUCLEAR PHYSICS] in Chinese Vol 13 No 2, Feb 89 pp 164-172

[English abstract of article by Li Shidong [2621 0013 2639], et al., of the National University of Defense Technology, Changsha; Zhuo Yizhong [0587 4135 1813], et al., of the Institute of Atomic Energy, Beijing]

[Text] According to the fission diffusion model, the deformation motion of fission nuclei is regarded as a diffusion process of quasi-Brownian particles under fission potential. By simulating such Brownian motion in a two-dimensional phase space by the Monte-Carlo method, the effect of nuclear viscosity on Brownian particle diffusion is studied. Dynamic quantities, such as the fission rate, kinetic energy distribution on scission, etc., are calculated numerically for various viscosity coefficients. The results are reasonable for use in physics. This method can be easily extended to deal with multi-dimensional diffusion problems.

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Study of Associated Gamma Ray from Niobium under 14.9 MeV Neutron Bombardments

40090045c Beijing GAONENG WULI YU HE WULI [HIGH ENERGY PHYSICS AND NUCLEAR PHYSICS] in Chinese Vol 13 No 2, Feb 89 pp 173-183

[English abstract of article by Zhou Hongyu [0719 1347 0151], et al., of the Institute of Low Energy Nuclear Physics, Beijing Normal University; Tang Lin [0781 2651] of the Department of Mathematical and Physical Sciences, National Natural Science Foundation of China, Beijing]

[Text] The gamma ray spectra from niobium under 14.9 MeV neutron bombardments were measured by means of a pulsed T(d, n)^{4}He neutron source, associated particle method, Ge(Li) detector and time-of-flight technique at seven angles between 30 degrees and 140 degrees. A total of 79 gamma lines were determined by a high resolution gamma spectrum analysis program, and reaction types and transition levels of 62 lines were rudely assigned. Of the 79 lines, 40 were first found in reactions induced by neutrons. The differential cross sections of every gamma line at seven angles were determined. It is shown that associated gamma ray emissions from this reaction are basically asotropic.

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